



PARENTAL KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING CHILDHOOD VACCINATION: A CROSS-SECTIONAL STUDY IN BOSNIA AND HERZEGOVINA

RODITELJSKA ZNANJA, STAVOVI I PRAKSE U VEZI S VAKCINACIJOM DJECE: STUDIJA PRESJEKA U BOSNI I HERCEGOVINI

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ABSTRACT

Vaccination is one of the most effective public health interventions, yet vaccine hesitancy continues to threaten high childhood immunization coverage. Parental attitudes, knowledge, and information sources play a critical role in shaping vaccination decisions, influencing both individual and community protection. A cross-sectional study was conducted between October and December 2024, including 120 parents of children covered by the national vaccination schedule. Data were collected via a self-administered 25-item questionnaire distributed through Google Forms, assessing demographics, knowledge, attitudes, and sources of vaccination-related information. Associations between participant characteristics and vaccination attitudes, knowledge, and compliance were analyzed using chi-square tests. Among participants, 95% reported compliance with the mandatory vaccination schedule, and 84.2% expressed a positive attitude toward childhood vaccination. The majority recognized

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vaccination as primarily benefiting the child (75%) and providing protection against severe disease (72.5%). Healthcare professionals were the main source of vaccination information (71.7%), while media and social networks were less frequently used. Awareness of the anti-vaccination movement was reported by 58.3%, and 43.3% of participants expressed trust in available vaccine information. Compliance was significantly associated with marital status and number of children, while knowledge correlated with educational level. Younger parents and urban residents relied more on media sources, whereas older and rural parents primarily consulted healthcare professionals. The findings indicate that parents in the studied region demonstrate positive attitudes toward childhood vaccination, with high compliance and a strong reliance on healthcare professionals as sources of information. Vaccine hesitancy persists in a minority, often influenced by misinformation and uncertainty. Targeted, prevention-oriented interventions focusing on health communication and support from healthcare professionals are essential to sustain high vaccination coverage and protect children and communities from vaccine-preventable diseases.

Keywords: child health, childhood vaccination, health communication, public health, vaccine hesitancy.

SAŽETAK

Vakcinacija je jedna od najefikasnijih javnozdravstvenih intervencija, ali oklijevanje prema vakcinaciji i dalje predstavlja prijetnju održavanju visokog obuhvata imunizacije djece. Stavovi roditelja, njihovo znanje i izvori informacija imaju ključnu ulogu u donošenju odluka o vakcinaciji, utičući kako na individualnu tako i na kolektivnu zaštitu. Studija presjeka provedena je u periodu od oktobra do decembra 2024. godine i obuhvatila je 120 roditelja djece obuhvaćene nacionalnim programom vakcinacije. Podaci su prikupljeni putem samopopunjavajućeg upitnika od 25 pitanja, distribuiranog putem Google Forms platforme, kojim su ispitivani demografski podaci, znanje, stavovi i izvori informacija o vakcinaciji. Povezanost između karakteristika ispitanika i stavova, znanja i pridržavanja vakcinacije analizirana je pomoću hi-kvadrat testa. Među učesnicima, 95% je prijavilo pridržavanje obavezne vakcinacijske sheme, a 84,2% je izrazilo pozitivan stav prema vakcinaciji djece. Većina ispitanika prepoznala je vakcinaciju kao prvenstveno korisnu za dijete (75%) i kao zaštitu od teških bolesti (72,5%). Zdravstveni radnici bili su glavni izvor informacija o vakcinaciji (71,7%), dok su mediji i društvene mreže korišteni rjeđe. Svijest o antivakcinalnom pokretu iskazalo je 58,3% ispitanika, a 43,3% je izrazilo povjerenje u dostupne informacije o vakcinama. Pridržavanje vakcinacije bilo je značajno povezano s bračnim statusom i brojem djece, dok je znanje koreliralo s nivoom obrazovanja. Mlađi roditelji i stanovnici urbanih sredina češće su se oslanjali na medije kao izvor informacija, dok su stariji roditelji i oni iz ruralnih područja prvenstveno konsultovali zdravstvene radnike. Rezultati ukazuju na to da roditelji u ispitivanom regionu pokazuju pozitivne stavove prema vakcinaciji djece, uz visok stepen pridržavanja i snažno oslanjanje na zdravstvene radnike kao izvore informacija. Oklijevanje prema vakcinaciji prisutno je kod manjeg broja roditelja, često pod utjecajem dezinformacija i nesigurnosti. Ciljane, preventivno usmjerene intervencije, s fokusom na zdravstvenu komunikaciju i podršku zdravstvenih radnika, neophodne su za

održavanje visokog obuhvata vakcinacije i zaštitu djece i zajednice od bolesti koje se mogu spriječiti vakcinama.

Ključne riječi: zdravlje djece, vakcinacija djece, zdravstvena komunikacija, javno zdravstvo, oklijevanje prema vakcinaciji.

INTRODUCTION

Vaccination campaigns over the past 200 years have resulted in the global eradication of smallpox, the elimination of poliomyelitis in most countries worldwide, and a reduction in mortality and morbidity from several infectious diseases. In order to maintain these achievements, a high vaccination coverage rate is necessary (at least 95% for most vaccines) (Facciola et al., 2019). Despite being recognized as one of the most effective public health interventions for disease control and prevention, an increasing number of Americans believe that vaccination is unsafe and unnecessary. Delay in acceptance or refusal of vaccination despite the availability of vaccination services is known as vaccine hesitancy, according to the Strategic Advisory Group of Experts on Immunization (SAGE) of the World Health Organization (WHO). Vaccine hesitancy is complex and context-specific, and it varies depending on time, place, and the type of vaccine. One specific issue in the United States is parental hesitancy regarding childhood vaccination, which may have harmful consequences for children and the communities in which vaccination is implemented (Olson et al., 2020). In many parts of the world, one in five children is still not vaccinated. To ensure that no child or adult suffers or dies from a vaccine-preventable disease, international cooperation, financial support, commitment, and vision will be required in the coming decades (WHO). Within the spectrum of interactions between vaccination service providers and individual parents, three aspects of “trust” are recognized: non-professional agents (family, peers, and social networks/media), authorities (policy, funding), and the physician acting as a professional delegate (Tal et al., 2021). Each of these represents a source of information that shapes parents’ opinions and attitudes toward vaccination, which can have a direct impact on their children’s immunization coverage. Information sources and parental attitudes toward childhood vaccination are variable depending on the socioeconomic and sociodemographic status of society (epidemics/pandemics, wars, marital status, maternal education, family income, family size), and are also influenced by personal factors such as individuals’ own experiences with vaccination (Obohwemu et al., 2022).

The aim of this study was to determine the current prevailing parental attitude toward childhood vaccination in our immediate geographical area, as well as to identify their level of knowledge and the most common sources of information they use. Such information may prove useful in identifying the need for interventions in cases of low childhood vaccination coverage, with the ultimate goal of preventing diseases that can be avoided through available vaccines.

MATERIAL AND METHODS

Sample of participant

A cross-sectional study was conducted between October 1 and December 31, 2024. A total of 120 parents voluntarily participated in the study. Prior to enrollment, all participants provided written informed consent, confirming that they had been fully informed about the objectives, purpose, and procedures of the study. All data were analysed in anonymised form.

The inclusion criteria were: parents of children covered by the current national vaccination schedule; willingness to participate in the study; and provision of responses to questions related to vaccination and attitudes toward immunization.

The exclusion criteria included: individuals without children or whose children were not included in the legally mandated vaccination schedule; individuals unwilling or unable to participate; and respondents who failed to answer key vaccination-related questions or did not complete the questionnaire.

Participants were classified into four age groups: under 25 years; 25–35 years; 36–45 years; and over 46 years.

Method of conducting research

Data were collected using a self-administered questionnaire specifically designed for the purposes of this study and distributed online via Google Forms. The questionnaire consisted of 25 items. The first seven questions addressed demographic characteristics of the participants, while the remaining 18 questions assessed knowledge, attitudes, and perceptions regarding vaccination. Questionnaires were distributed to parents living in both urban and rural areas, ensuring representation from different residential settings.

Measuring instruments

The questionnaire included items related to demographic and socioeconomic characteristics (sex, age, marital status, level of education, employment status, place of residence, and number of children), as well as questions assessing parental attitudes toward childhood vaccination, perceived benefits and risks of vaccination, trust in vaccine-related information, sources of information, and awareness of the anti-vaccination movement.

Data processing methods

Collected data were processed and analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics were applied to summarize the basic characteristics of the study sample, including frequencies and percentages. The chi-square (χ^2) test was used to examine associations between nominal and ordinal variables, such as gender, age group, marital status, and educational level, in relation to attitudes toward vaccination. Statistical significance was defined as a p-value < 0.05.

RESULTS AND DISCUSSION

The study included 120 participants, with a majority being female (65%) and most aged between 25 and 45 years. Participants predominantly lived in urban areas (63.3%), were married (88.3%), and employed (80.8%). Educational levels were generally high, with the largest groups having completed secondary or higher education, and families mostly had one or two children. Detailed demographic and socioeconomic characteristics are summarized in Table 1.

Table 1. Demographic and Socioeconomic Characteristics of the Study Participants (N = 120)

Variable	Category	n	%
Marital status	Single	1	0.8
	In a relationship	3	2.5
	Married	106	88.3
	Divorced	8	6.7
	Widowed	2	1.7
Level of education	Primary school or less	8	6.7
	Secondary education	42	35.0
	Post-secondary education	29	24.2
	Higher education	41	34.2
Employment status	Employed	97	80.8
	Unemployed	23	19.2
Number of children	One child	47	39.2
	Two children	61	50.8
	Three or more children	12	10.0

The majority of participants reported compliance with the legally mandated childhood vaccination schedule, with 95.0% indicating that they regularly vaccinate their children in accordance with current regulations. A small proportion of respondents (5.0%) reported non-compliance with mandatory vaccination. Regarding attitudes toward childhood vaccination, most participants expressed a favorable view, with 84.2% supporting vaccination. In contrast, only 3.3% reported a negative attitude, while 12.5% of participants indicated uncertainty. Overall, these findings reflect a high level of acceptance of childhood vaccination, although a minority of respondents expressed hesitancy or opposition, as summarized in Table 2.

Table 2. Attitudes Toward Childhood Vaccination Among Participants (N = 120)

Attitude toward vaccination	n	%
Support vaccination	101	84.2
Oppose vaccination	4	3.3
Undecided about vaccination	15	12.5

In response to the question regarding who benefits most from vaccination, the majority of participants (75.0%) believed that the primary beneficiary is the child. A smaller proportion of respondents (14.2%) indicated that vaccination mainly benefits the community. Additionally, 10.8% of participants expressed the view that the greatest benefit is obtained by pharmaceutical companies producing vaccines. These perceptions are presented in Table 3.

Table 3. Parents' Perceptions of the Primary Beneficiary of Vaccination (N = 120)

Perceived beneficiary	n	%
Child	90	75.0
Community	17	14.2
Pharmaceutical companies producing vaccines	13	10.8

When questioned about the possibility of a vaccinated child still contracting the disease against which they were immunized, 63.3% of participants acknowledged that infection could still occur. Conversely, 15.8% believed that vaccination provides complete protection, while 20.8% remained uncertain. Regarding the protective role of vaccination against severe disease forms and related complications, the majority of participants (72.5%) acknowledged that vaccination provides such protection. In contrast, 6.7% disagreed with this statement, whereas 20.8% of respondents reported no definitive opinion.

In response to the statement that acquiring immunity through natural infection is preferable to vaccination, 16.7% of participants agreed. Conversely, 65.8% considered vaccination to be a safer and more effective means of protection, while 17.5% remained undecided. Overall, these findings suggest a predominantly positive perception of vaccination effectiveness and safety, although a considerable proportion of participants demonstrated uncertainty across several vaccination-related concepts.

Table 4. Parents' Attitudes Regarding the Effectiveness and Safety of Childhood Vaccination (N = 120)

Question	Response	n	%
Do you believe that a vaccinated child can develop the disease against which they were vaccinated?	Yes	76	63.3
	No	19	15.8
	I do not know	25	20.8
Do you believe that vaccination protects a child from severe forms of the disease and related complications?	Yes	87	72.5
	No	8	6.7
	I do not know	25	20.8
Do you believe that potential vaccine side effects are more dangerous than the disease itself?	Yes	36	30.0
	No	53	44.2
	I do not know	31	25.8
Do you believe it is better for a child to acquire immunity through natural infection rather than vaccination?	Yes	20	16.7
	No	79	65.8
	I do not know	21	17.5

According to participants' responses, 6.7% believed that their children receive more vaccines than necessary, whereas the majority (74.2%) considered the number of administered vaccines to be appropriate. Nearly one fifth of respondents (19.2%) reported uncertainty regarding this issue.

More than half of the participants (53.3%) stated that decisions regarding childhood vaccination should be made by parents, while 40.0% believed that such decisions should not be the sole responsibility of parents but should also involve relevant institutions. A small proportion of respondents (6.7%) did not express a definitive opinion.

Regarding self-assessed knowledge about vaccination, one quarter of participants (25.0%) rated their knowledge as very good, and 58.3% assessed it as good. In contrast, 16.7% of respondents perceived their knowledge as insufficient. Overall, these findings indicate a generally positive perception of vaccination-related knowledge, although a notable minority of participants expressed uncertainty or perceived informational gaps.

Table 5. Parents' Perceptions of Childhood Vaccination, Decision-Making, and Self-Assessed Knowledge (N = 120)

Question	Response	n	%
Do you believe that your children receive more vaccines than necessary?	Yes	8	6.7
	No	89	74.2
	I do not know	23	19.2
Do you believe that parents should make decisions regarding childhood vaccination?	Yes	64	53.3
	No	48	40.0
	I do not know	8	6.7
How do you assess your knowledge and level of information about vaccination?	Very good	30	25.0
	Good	70	58.3
	Insufficient	20	16.7

When exploring beliefs regarding a possible association between vaccination and autism, 20.8% of participants reported the belief that certain vaccines may cause autism in children. In contrast, 35.8% rejected this notion, while a considerable proportion of respondents (43.3%) expressed uncertainty, indicating a lack of a clearly formed opinion on this topic.

In terms of trust in vaccine-related information, less than half of the participants (43.3%) reported confidence in the information they receive. Conversely, 21.7% indicated distrust, and over one third of respondents (35.0%) remained uncertain regarding the reliability of available information.

With respect to sources of vaccination-related information, healthcare professionals were identified as the primary source by the majority of participants (71.7%), underscoring the central role of medical personnel in parental education. Media outlets, including television, radio, internet platforms, and social media, were cited by 22.5% of respondents, while only a small proportion (5.8%) relied on friends or family members for vaccine-related information. These findings are summarized in Table 6.

Table 6. Attitudes Toward Vaccination, Information Sources, and Perceived Association With Autism (N = 120)

Question	Response	n	%
Do you trust the information you receive about vaccines?	Yes	52	43.3
	No	26	21.7
	I do not know	42	35.0
From whom do you receive information about vaccination and vaccine types?	Healthcare professionals	86	71.7
	Family and friends	7	5.8
	Media (radio, television, internet, social media)	27	22.5
Do you believe that some vaccines can cause autism in children?	Yes	25	20.8
	No	43	35.8
	I do not know	52	43.3

With regard to awareness of the anti-vaccination movement, 58.3% of participants reported being familiar with this movement, whereas 41.7% indicated that they were not informed about the topic. When asked whether they believed that advocates of the anti-vaccination movement are sufficiently educated and competent, 45.0% of respondents expressed a negative opinion, while only 5.8% responded affirmatively. Notably, nearly half of the participants (49.2%) remained undecided, reflecting uncertainty regarding the education and competence of individuals promoting this movement. These findings are presented in Table 7.

Table 7. Awareness of the Anti-Vaccination Movement and Perceived Education and Competence of Its Advocates (N = 120)

Question	Response	n	%
Are you familiar with the anti-vaccination movement?	Yes	70	58.3
	No	50	41.7
Do you believe that advocates of this movement are sufficiently educated and competent?	Yes	7	5.8
	No	54	45.0
	I do not know	59	49.2

Compliance with the mandatory childhood vaccination schedule was significantly associated with marital status ($p = 0.040$) and number of children ($p = 0.036$). Among marital status groups, married parents were the most likely to report adherence to the recommended vaccination schedule (102 out of 106, 96.2%), while single parents and those in a relationship showed slightly lower compliance. Parents with two children were fully compliant (61 out of 61, 100%), whereas compliance was slightly lower among parents with one child (42 out of 47, 89.4%) or three or more children (11 out of 12, 91.7%). Other variables, including place of residence, employment, age, sex, and level of education, did not show significant associations with compliance (all $p > 0.05$).

Self-assessed knowledge and information about vaccination was significantly associated with level of education ($p = 0.038$). Parents with higher education most frequently rated their knowledge as “very good” or “good” (38/41, 92.7%), while parents with only secondary

education or post-secondary education reported slightly lower self-assessed knowledge. No significant differences were observed based on marital status, place of residence, employment, age, sex, or number of children.

Regarding sources of vaccination-related information, significant associations were observed for place of residence ($p = 0.005$) and age group ($p = 0.002$). Parents living in urban areas were more likely to report media sources (15/76, 19.7%) compared with rural residents (12/54, 21.4%), while rural parents relied predominantly on healthcare professionals (44/56, 78.6%). Younger parents (<25 years) were more likely to obtain information from media sources (5/7, 71.4%), whereas older parents primarily received information from medical staff. Other demographic variables, including marital status, employment, sex, level of education, and number of children, were not significantly associated with the reported sources of information.

Table 8. Associations Between Demographic Factors and Vaccination-Related Outcomes

Demographic factor	Compliance with mandatory vaccination (p-value)	Self-assessed knowledge about vaccination (p-value)	Source of vaccination information (p-value)
Place of residence	0.056	0.416	0.005*
Marital status	0.040*	0.722	0.608
Employment status	0.873	0.324	0.324
Age group	0.097	0.526	0.002*
Sex	0.429	0.520	0.113
Level of education	0.184	0.038*	0.861
Number of children	0.036*	0.821	0.225

*- statistical significance $p < 0.05$

The present study explored parents knowledge, attitudes, and practices regarding childhood vaccination. The findings indicate that the majority of participants demonstrate high acceptance of mandatory childhood vaccines, with 95% reporting adherence to the recommended schedule and 84.2% expressing positive attitudes toward immunization. These results align with international studies, which generally report high levels of vaccine acceptance, although with notable variations across countries and social groups. Global research suggests that despite occasional fluctuations and transient increases in vaccine hesitancy, most parents support routine immunization programs (Bayram Değer & Yiğitalp, 2024). Our findings indicate that compliance with the mandatory childhood vaccination schedule was significantly associated with marital status and number of children, highlighting the influence of family structure on vaccination behaviors. Married parents demonstrated the highest adherence, while single parents and those in a relationship showed slightly lower compliance. This aligns with prior research suggesting that stable family environments and

shared decision-making among partners may facilitate consistent adherence to preventive health measures, including vaccination (Kuroda et al., 2022). Similarly, the number of children was a significant determinant of compliance. Parents with two children exhibited complete adherence, whereas those with only one child or three or more children showed slightly lower rates. This pattern may reflect a combination of experience and perceived responsibility: parents with multiple children likely have greater practical familiarity with healthcare services, which may reinforce adherence to vaccination recommendations, whereas first-time parents often face heightened uncertainty. Additionally, parents of larger families may encounter logistical challenges or an overload of information. Similar trends have been observed in other studies, suggesting that family size can shape vaccine decision-making through both experiential and practical pathways (Kuuyi & Kogi, 2024).

Our analysis did not identify consistent associations between basic sociodemographic factors, such as gender or number of children, and positive vaccination attitudes. However, parents' academic level and place of residence emerged as significant determinants of vaccination knowledge and adherence. In our cohort, higher adherence to the childhood vaccination schedule was significantly associated with having an academic degree, indicating that education may enhance trust in vaccines and understanding of immunization schedules, consistent with prior studies reporting that parental education is a key predictor of vaccine acceptance (Tal et al., 2021). In our study, sources of vaccination-related information were significantly associated with place of residence and age group, with rural parents relying predominantly on healthcare professionals. This is consistent with previous findings showing that urban parents generally have higher vaccination-related knowledge and access to a wider range of information sources, while rural parents depend more on medical professionals (Evrán & Bekis Bozkurt, 2022; Lamot & Kirbiš, 2024). This geographic variation underscores the need for tailored communication strategies, emphasizing trusted healthcare guidance in rural areas while ensuring accurate, accessible information through media and online platforms for urban populations (Olson et al., 2020). Interestingly, age also influenced information-seeking behavior, with younger parents more likely to consult media sources, while older parents relied more heavily on healthcare professionals. This trend aligns with literature suggesting generational differences in digital literacy and trust in online versus professional sources, emphasizing the importance of multi-modal information campaigns targeting different age groups (Ashfield et al., 2024). A number of recent studies have highlighted the profound role of online media and social marketing in shaping parental attitudes toward childhood vaccination. For example, Melovic and colleagues found that online media exert a significant influence on parents' vaccination attitudes, with different aspects of online information use correlating with variations in trust in vaccines and perceptions of vaccination benefits and risks. Their work, conducted across multiple Western Balkan countries, demonstrated that parents who extensively engage with online sources, including health websites, blogs, forums, and social networks, exhibit distinctive patterns of vaccine confidence, and that content emphasizing negative vaccine effects can contribute to attitudes of hesitancy (Melovic et al., 2020).

Recent evidence suggests that parental vaccine literacy including the ability to understand and critically evaluate vaccine-related information and positive interactions with healthcare

providers are strong correlates of lower vaccine hesitancy and higher vaccine confidence (Zheng et al., 2025). Parents who have difficulty comprehending information from health professionals are more likely to exhibit hesitancy, underscoring the importance of clear communication and effective health literacy interventions in improving vaccination attitudes. This investigation examined participants awareness of the anti-vaccination movement and their perceptions of the competence of its advocates. While many were familiar with the movement, a substantial proportion remained uncertain about the knowledge and credibility of its proponents. Negative perceptions predominated over positive ones, reflecting a generally critical stance toward anti-vaccine activities. Compared with previous research, including the study conducted in Poland, the findings reveal a similar trend of skepticism toward the movement. Awareness in this sample appears somewhat lower, and uncertainty regarding the competence of anti-vaccine advocates is more pronounced. These observations suggest that although explicit support for the movement is limited, a considerable portion of the population has yet to form a definitive opinion, highlighting an important opportunity for targeted educational interventions (Pisaniak et al., 2021).

This study has several limitations. First, its cross-sectional design prevents causal inferences about the relationships between attitudes and predictors such as information source. Second, the sample size and single-community context may limit generalizability. Third, self-reported attitudes could be influenced by social desirability bias, especially regarding compliance with recommended vaccination practices. Future research using longitudinal designs and larger, diverse samples could provide more definitive insights into factors shaping parental vaccination decisions.

CONCLUSION

Vaccination remains one of the most effective preventive public health interventions; however, maintaining high childhood immunization coverage continues to be challenged by vaccine hesitancy. The findings of this study are consistent with those of similar research conducted in other settings, indicating that parents in our region face comparable issues, including concerns about vaccine safety, the influence of misinformation and antivaccination movements, and varying levels of trust in healthcare professionals and institutions. These shared challenges suggest that strategies successfully applied elsewhere such as strengthening health communication, improving prevention literacy, and supporting healthcare professionals as trusted sources of information can also be effectively implemented in our context. Clearly defined, prevention-oriented and target-group-specific interventions are therefore essential to improve vaccination coverage and ensure sustained protection against vaccine-preventable diseases.

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