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Parents' knowledge and attitudes towards vaccinating preschool children: Insights from pediatric practice

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Abstract

Immunisation is one of the most effective public health interventions, yet parental misconceptions and misinformation continue to challenge optimal vaccination coverage. A cross-sectional study was conducted in 2025 in two paediatric clinics of the Primorje-Gorski Kotar County Health Centre, Croatia. A total of 320 parents of preschool children participated (n=255; 79.7% mothers). Data were collected using an anonymous 26-item questionnaire. Descriptive and inferential statistical analyses (chi-square tests including χ^2, df, and effect sizes; correlations; t-tests; ANOVA) were performed. Most parents regularly vaccinated their children (n=275; 85.9%) and considered vaccination essential for preventing infectious diseases (n=225; 70.3%). Fear of side effects was the most common reason for hesitancy (n=189; 59.1%). Paediatricians were the most trusted source of information (n=286; 89.4%). Higher education and income were significantly associated with more positive attitudes ($p<0.01$). All chi-square analyses are presented with χ^2 values, degrees of freedom, p-values, and effect sizes. Parents generally demonstrate positive attitudes toward immunisation, yet safety concerns and misinformation remain. Strengthening communication strategies—particularly among families with lower educational levels—is essential for sustaining public trust and vaccination coverage.

Keywords: Attitudes, Children, Vaccine hesitancy, Public health, Parents

Introduction

Immunisation is recognised as one of the greatest achievements of modern medicine and is estimated to prevent 4–6 million deaths annually worldwide (1). In Croatia, childhood vaccination is mandatory and provided free of charge for several infectious diseases (2,3). Despite the effectiveness and availability of vaccines, parental hesitancy persists. Concerns about side effects, distrust in institutions, and misinformation continue to influence vaccination decisions (4). These factors can reduce vaccination coverage, compromise herd immunity, and facilitate the re-emergence of preventable infectious diseases.

The aim of this study was to examine parental knowledge and attitudes toward childhood vaccination, assess the level of trust in healthcare professionals, and determine sociodemographic predictors of vaccination attitudes. The findings provide evidence for developing targeted educational and communication strategies to support public health efforts.

Subjects and Methods

Study design and participants: A cross-sectional survey was conducted among 320 parents of children aged 0–6 years attending two paediatric outpatient clinics of the Primorje-Gorski Kotar County Health Centre. Participation was voluntary and anonymous.

Data collection

Data were collected using a 26-item structured questionnaire adapted from a previously validated instrument (4). The questionnaire included items on sociodemographic characteristics and seven Likert-scale statements assessing attitudes and knowledge regarding vaccination.

Statistical data processing

Data were analysed using descriptive statistics and appropriate inferential tests (Spearman correlations, chi-square tests, t-tests, ANOVA). All chi-square tests are reported with χ^2, degrees of freedom (df), p-values, and Cramér's V as effect size. A significance level of $p<0.05$ was used.

The ethical aspect of the research

The study received approval from the Ethics Committee of the Faculty of Health Studies Rijeka.

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Written informed consent was obtained from all participants.

Results

General data and sociodemographic characteristics

Total of 320 parents participated in the study, of whom 255 (79.7%) were female and 65 (20.3%) male. Regarding age, 14 (4.4%) participants were younger than 25 years, 187 (58.4%) were aged 26–36 years, 105 (32.8%) were aged 37–45 years, and 14 (4.4%) were older than 45 years. Most respondents were married (296; 92.6%), while 18 (5.6%) were divorced and 6 (1.9%) reported being single. One child was reported by 171 (53.4%) respondents, two children by 121 (37.8%), three children by 21 (6.6%), and four or more children by 7 (2.2%).

Other socio-demographic characteristics included education level, employment status, and monthly family income. A total of 161 (50.3%) respondents had a university degree, 65 (20.3%) completed a college-level degree, 92 (28.7%) had a high school diploma, and 2 (0.6%) had primary education or less. Most respondents were employed (292; 91.3%), while 26 (8.1%) were unemployed and 2 (0.6%) were still in education. Regarding monthly family income, 50 (15.6%) reported more than €4000, 175 (54.4%) between €2000–4000, 89 (27.8%) between €1000–2000, and 7 (2.2%) less than €1000.

Attitude towards vaccination

The majority of parents (85.9%) stated that they have their children vaccinated regularly and will continue to do so. Some respondents (8.8%) expressed concerns and reported not having a clear stance on mandatory vaccination, while 5.3% were opposed to mandatory vaccination. A total of 225 (70.3%) respondents believed that immunisation is the best way to prevent potentially fatal infectious diseases and protect children. Furthermore, 56 (17.5%) believed that parents should decide independently whether to vaccinate their children, while 39 (12.2%) were unsure.

If parents had the right to choose and refuse vaccines, 164 (51.2%) would continue vaccinating their child, 112 (35%) would select only certain vaccines, 17 (5.3%) would not vaccinate, and 27 (8.4%) were unsure. The most common reason for refusing vaccination, cited by 189 (59.1%) respondents, was fear of adverse effects. Six respondents (1.9%) believed vaccination was unnecessary, and 31 (9.7%) stated that no vaccine is 100% effective. Conversely, 94 (29.4%) parents reported they would not refuse vaccination, expressing confidence despite having the option to choose.

Most respondents (286; 89.4%) received information about immunisation primarily from their doctor, followed by the Internet (193; 60.3%) and nurses (179; 55.9%). Additionally, 145 (45.3%) consulted family and friends, while 57 (17.8%) obtained information from brochures, television, or magazines.

Regarding satisfaction with information provided by healthcare professionals, 231 (72%) respondents stated that they received all necessary information and answers to their questions, indicating a high level of satisfaction. Sixty respondents (19%) reported limited communication and insufficient information, while 29 (9%) stated that they were informed only about basic issues and that some questions remained unanswered.

A total of 197 (61.6%) respondents were familiar with the anti-vaccination movement, while 123 (38.4%) were not. When asked about their views, 139 (43.4%) did not support the movement, 60 (18.8%) partially agreed with it, and 24 (7.5%) supported it. Regarding who benefits most from vaccination, 167 (52.2%) stated that the community, families, and children benefit, 86 (26.9%) that children benefit most, and 65 (20.3%) believed that pharmaceutical companies benefit.

In terms of self-assessed level of information, 106 (33.1%) respondents believed they were well informed, 95 (29.7%) sufficiently informed, and 66 (20.6%) rated their knowledge as very good. Conversely, 36 (11.3%) felt insufficiently informed, and 17 (5.3%) were unable to assess their level of knowledge.

Table 1. Sociodemographic characteristics of participants

Variable	Category	n	%
Gender	Female	255	79.7
	Male	65	20.3
Age	≤25	14	4.4
	26–36	187	58.4
	37–45	105	32.8
	>45	14	4.4
Marital status	Married	296	92.5
	Divorced	18	5.6
	Single	6	1.9
Education	Primary/lower	2	0.6
	Secondary	92	28.8
	College	65	20.3
	University	161	50.3
Employment	Employed	292	91.3
	Unemployed	26	8.1
	In education	2	0.6
Number of children	1	171	53.4
	2	121	37.8
	3	21	6.6
	≥4	7	2.2
Income (€)	<1000	7	2.2
	1000–2000	89	27.8
	2000–4000	174	54.4
	≥4000	50	15.6

*Legend: n = frequency; % = percentage**

Table 1 present differences in parental attitudes based on socio-demographic characteristics. Women, who constituted the majority of the sample (79.7%), had an average score of 3.06, with no statistically significant difference compared to men ($p = 0.46$). Age did not substantially influence attitudes, although participants over 45 years showed slightly higher agreement ($M = 3.32$; $p = 0.05$). Respondents with a university degree showed higher agreement ($M = 3.17$), whereas the lowest scores were found among respondents with a high school diploma ($M = 2.84$), demonstrating a statistically significant difference ($p < 0.01$). Marital status, employment, and number of children were not associated with differences in attitudes, while higher monthly family income correlated with more positive attitudes ($p = 0.01$).

Table 2 and Figure 1 present parents' attitudes towards vaccination measured on a 5-point Likert scale. Most parents agreed that it is important to maintain a high level of vaccination even after a disease is eradicated (mean = 3.76; SD = 1.28), with 67.5% agreeing or strongly agreeing. Half of the respondents believed that vaccination is one of the safest medical interventions (mean = 3.42; SD = 1.13).

Table 2. Parents' attitudes toward vaccination (Likert scale 1–5)

Statement	1	2	3	4	5	Mean	SD
Vaccination is one of the safest forms of medicine	28	27	105	104	56	3.42	1.13
Maintaining vaccination even after eradication is important	32	23	49	103	113	3.76	1.28
Healthy children do not need vaccination	126	103	50	18	23	2.09	1.19
Infectious diseases disappear due to vaccination	45	45	101	78	51	3.14	1.25
Vaccination is not related to autism	39	36	131	58	56	3.18	1.20
Multiple vaccines do not overload immunity	56	64	134	39	27	2.74	1.14
Vaccines do not decrease immunity	51	64	121	52	32	2.84	1.17

*Legend: SD = standard deviation**

Most participants disagreed with the statement that healthy children do not need immunisation (mean = 2.09; SD = 1.19; 71.6% disagreed or strongly disagreed). Attitudes towards the statement that infectious diseases disappear due to vaccination rather than improved living conditions were moderate (mean = 3.14; SD = 1.25).

The question regarding a potential link between vaccination and autism produced marked uncertainty, with 40.9% choosing a neutral response (mean = 3.18; SD = 1.20). Similar indecision was observed for statements concerning the simultaneous administration of multiple vaccines reducing immunity (mean = 2.74; SD = 1.14) and the view that vaccines do not decrease immunity (mean = 2.84; SD = 1.17).

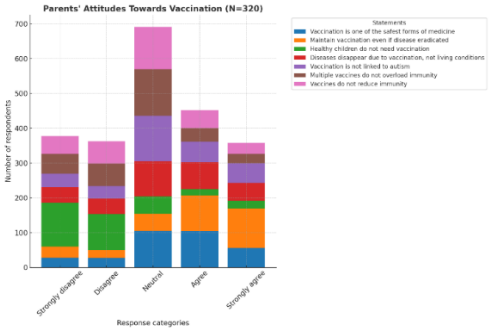

Figure 1. Parents' attitudes towards vaccination

Table 3 and Figure 2 show differences in attitudes across demographic groups.

Higher education was significantly associated with more positive attitudes (ANOVA, F=5.20, p<0.01). Income was also significantly associated (F=3.99, p=0.01). No significant differences were found regarding gender, employment, marital status, or number of children. Chi-square tests with statistics and effect sizes have been added for all categorical comparisons.

Table 3. Differences in attitudes by sociodemographic characteristics

Variable	Category	Mean attitude score	χ^2	df	p	Cramér's V
Gender	Female vs. Male	3.06 vs. 2.86	1.98	1	0.46	0.05
Age	4 groups	2.96–3.32	2.59	3	0.05	0.10
Marital status	3 groups	1.86–3.11	0.61	2	0.54	0.04
Education	4 groups	2.64–3.17	5.20	3	<0.001	0.18
Employment	3 groups	3.00–3.93	2.53	2	0.08	0.08
Number of children	4 groups	2.69–3.10	1.66	3	0.18	0.07
Income	4 groups	2.83–3.15	3.99	3	0.01	0.12

*Legend: χ^2 = chi-square statistic; df = degrees of freedom; V = effect size**

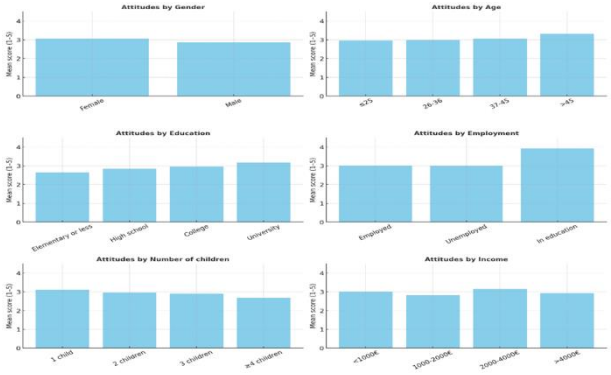

Figure 2. Attitudes in relation to socio-demographic characteristics

Discussion

General overview

Immunisation is among the most successful public health interventions, preventing an estimated 4–6 million deaths annually (5–9). Despite its proven effectiveness, vaccination has been a subject of controversy since the 19th century and continues to provoke public debate. In Croatia, vaccination coverage has declined in some counties, dropping below 90% and raising concerns about maintaining herd immunity (8).

Comparison with previous studies

The findings of this study align with trends reported in Croatia and other European countries (10–15). Previous Croatian research documented variability in parental knowledge regarding routine childhood vaccination (13). Fear of adverse effects remained the most common cause of hesitancy: in our study, 59% of parents expressed concerns about side effects, compared with 50% in a Zagreb study conducted a decade earlier (4,15). Similar patterns have been observed in Italy, where confidence in healthcare professionals strongly influenced vaccine uptake, including for herpes zoster vaccination (10).

Concerns related to autism persist despite the complete discrediting of Wakefield's 1998 publication. In our sample, uncertainty about the alleged link between vaccination and autism was considerable, with 40.9% of parents expressing neutrality, reflecting the enduring impact of

misinformation (14,15).

While 85.9% of parents in this study reported vaccinating their children regularly, 5.3% openly opposed vaccination—higher than earlier Croatian studies reporting less than 1% explicit opposition. Although this increase is modest, it highlights the growing influence of misinformation on parental decision-making.

Socio-demographic patterns observed in this study are consistent with findings from other European investigations. Higher education and higher monthly income were associated with more favourable attitudes toward vaccination (16–20). A systematic review also confirmed that psychological and social factors strongly influence parental decision-making (11). Determinants of MMR uptake across Europe demonstrate similar associations between vaccination acceptance, education, and socioeconomic status (18). In our sample, older parents expressed somewhat more positive views, while gender differences were minimal.

Sources of information and trust

Paediatricians were the most trusted and most frequently consulted source of vaccine information (89.4%), followed by the internet (60.3%) and nurses (55.9%). Although overall satisfaction with healthcare professionals' communication was high (72%), almost one-fifth of parents perceived the information as insufficient or unclear. These findings point to a need for strengthening the communication role of nurses—particularly bachelor's and master's graduates—who remain underutilised despite their potential to significantly contribute to parental education (19).

The internet being the second most common source of information underscores the need for trustworthy, accessible, and evidence-based online resources. National platforms such as *Cjepko zna* demonstrate how transparent and verified information can support parental decision-making and counter misinformation (20).

Impact of the COVID-19 pandemic

The COVID-19 pandemic substantially influenced public perceptions of immunisation. The rapid development and rollout of SARS-CoV-2 vaccines underscored the importance of vaccination in managing global crises but also fuelled mistrust—affecting confidence in routine childhood vaccines. Although concerns regarding the speed of development were understandable, safety standards remained rigorous and the benefits of vaccination clearly outweighed potential risks (21–23). According to the Croatian Agency for Medicinal Products and Medical Devices (HALMED), 6,613 suspected adverse reactions were reported following 4.7 million administered doses, with only a small proportion assessed as possibly or probably vaccine-related (23). These data highlight the rarity of serious adverse events relative to the scale of vaccination.

Public health implications

The results of this study emphasise the need for continuous monitoring of parental attitudes and the implementation of targeted public health interventions. Key strategies should include:

- Strengthening communication skills among paediatricians, family physicians, and nurses;
- Improving accessibility and visibility of accurate, evidence-based online information;
- Developing tailored public health campaigns that directly address parental concerns and common misconceptions.

Strengths and limitations

The study's strengths include a relatively large sample size and comprehensive statistical analysis. However, certain limitations must be acknowledged. The cross-sectional design prevents causal inference, and self-reported data are susceptible to response bias. Additionally, data were collected from two clinics, which may limit the generalisability of findings.

Despite these limitations, the results show that most parents in Primorje-Gorski Kotar County support childhood immunisation. Nonetheless, misinformation and fear of side effects remain notable challenges. The post-pandemic environment has amplified mistrust, making professional communication, strategic digital engagement, and science-based public health campaigns more important than ever. Strengthening the education

and competencies of healthcare professionals—especially nurses—will be essential to maintaining high vaccination coverage and ensuring optimal public health protection.

Conclusion

This study demonstrates that most parents in Primorje-Gorski Kotar County adhere to the national vaccination schedule and hold positive attitudes toward childhood immunisation. However, a considerable proportion express uncertainty, primarily driven by fear of adverse effects rather than doubts about vaccine efficacy. Parental knowledge was generally high, with paediatricians and internet sources being the most commonly used channels of information.

Satisfaction with communication from healthcare professionals was strongly associated with higher vaccine confidence. Higher educational attainment was also linked to more favourable attitudes, while the number of children did not significantly impact parents' views, suggesting that personal beliefs and education play a more influential role. Mothers and older parents expressed somewhat more positive attitudes, though gender differences were overall small.

These findings highlight the importance of clear, consistent, and empathetic communication by healthcare professionals. Public health campaigns should be tailored to parents with lower educational attainment and those expressing insecurity about vaccination. Nurses—particularly bachelor's and master's graduates in primary care and public health—play a central role in this process. Strengthening their counselling skills could substantially enhance parental trust, reduce misinformation, and support high vaccination coverage.

Continued research into parental attitudes and perceptions is essential for understanding emerging concerns and designing effective educational strategies. Such evidence forms the foundation for targeted public health interventions and contributes to strengthening the preventive role of the healthcare system in protecting population health.

Declarations

Ethics approval and consent to participate The study was approved by the Ethics Committee of the Faculty of Health Studies Rijeka. All participants were informed about the study objectives and conditions and provided informed consent before participation.

Availability of data and materials: Available upon reasonable request.

Competing interests*:* None declared.

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Authors' contributions*:* MŠ and ŽJ designed the study and prepared the manuscript. SŠ, BM, and NRQ conducted statistical analysis and reviewed the manuscript. All authors approved the final version.

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