

Vaccine refusal risk factors among parents of children with autism spectrum disorders

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ABSTRACT

Background. Vaccine refusal is a global trend and was announced as one of the top ten health threats in recent years. The rate of vaccine refusal (VR) among children with autism spectrum disorders (ASD) has also increased in parallel with the global trend but their vaccination behavior may differ from that of the normal population. This study aims to determine the VR rates among parents of children with ASD, to define the risk factors for developing VR, and to evaluate the parental concerns for childhood vaccinations in this susceptible population.

Methods. We conducted a 4-part survey questionnaire among parents of children with ASD, evaluating the vaccination status for both the child with ASD and their younger sibling. The vaccination uptake of the first child was accepted as the 'baseline' behavior, while the following sibling's uptake was suggested as the 'current' behavior. The risk factors of VR were determined with logistic regression analysis.

Results. The study group included 110 parents of children with ASD (M/F:76/34) and their younger siblings (M/F:57/53). The rate of 'baseline VR' was 12.7% whereas the 'current VR' was 40% (p=0.001). High socioeconomic status (relative risk [RR]: 4.4; 95% confidence interval [CI]: 1.01-16.6; p=0.04), using social media as the main source of information (RR: 7; 95% CI: 1.5-32; p= 0.01) and lack of regular well-child visits of the sibling (RR: 25; 95% CI 4.1-166; p=0.001) were determined as risk factors for VR.

Conclusions. The vaccination behavior of parents changed after having a child with ASD, and thus, the younger siblings may constitute a risk group for VR. In clinical practice, pediatricians should be aware of this risk and evaluate the vaccination uptake of the younger siblings of children with ASD more carefully. Regular well-child visits and improving media literacy may be the key points to prevent VR in this susceptible population.

Key words: autism spectrum disorder, vaccine refusal, childhood, vaccination behavior.

Vaccine refusal (VR) is a growing global trend constituting a substantial threat to reverse the progress made in tackling vaccine-preventable diseases. The World Health Organization (WHO) has announced VR as one of the ten threats to global health by 2019.¹ Since then, the coronavirus disease 2019 (COVID-19) pandemic has arisen and affected vaccination behavior on both ends of the spectrum: increased awareness of vaccination against infectious diseases,

especially among the people who accept vaccines, and increased refusal and hesitancy, most probably due to mistrust in novel vaccines.² Previous research has shown that newer vaccines generate more hesitancy.³ To tackle VR and hesitancy, WHO recommends that each country take steps to develop an understanding at a local level on an ongoing basis that differs according to the cultural, societal, and personal beliefs of a particular region in addition to the worldwide needs and concerns.⁴

In Türkiye, although the cases of VR were very few previously and only 180 families refused vaccination in 2011, the anti-vaccination movement has shown a rapid increase in the last 10 years, especially after a public prosecutor

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refused the vaccination of his twin children in 2015. The local court decided that the children should be vaccinated despite the father's refusal, but the Supreme Court decided that vaccination requires "consent from parents for vaccination". The Supreme Court decision was dubbed "the prosecutor father's victory" by the press.⁵ Meanwhile the number of VR cases approached 25,000 as of 2018.⁶

It was previously reported that families with children who had ASD were less likely to vaccinate their subsequent children.⁷ Compatible with this, younger siblings of children with ASD were reported to have delayed and/or refused vaccination and reduced overall vaccination rates when compared to both the general population and their older siblings with ASD.⁸ Parents of children with ASD may be prone to ignore genetic causes of the disorder and instead blame environmental factors for its development. In addition, they may believe in non-evidence-based information about developmental disorders and vaccines. However, there is a lack of knowledge about the reasons and risk factors that cause VR among parents of children with ASD, leading to reduced vaccination rates among the younger siblings.

This study aimed to determine the VR rates among parents of children with ASD, to define the risk factors for developing VR after having a child with ASD, and to evaluate the parental concerns about childhood vaccines in this susceptible population.

Material and Methods

Study design and participants

This was a descriptive study conducted among parents of children with ASD who were being followed up by the Department of Child and Adolescent Psychiatry of İzmir Dr. Behçet Uz Children's hospital which is a tertiary hospital for children. The study was reviewed and approved by the Local Ethics Committee of Behçet Uz Children's Hospital on 08.03.2018

(Protocol no: 2018/196, Decision No: 2018/05-01) and participation involved informed consent.

The diagnosis of the patients and severity levels for the disorder were based on the Diagnostic and Statistical Manual of Mental disorders: DSM-5.⁹ The parents were first asked if they had a consecutive child, and if yes, they were asked to participate in the study. The offer to participate in the study was made at the end of their visit to maintain complete volunteerism. The parents whose consecutive child's vaccination schedule was continuing for primary immunisation (<2 years of age), completed before an ASD diagnosis and parents of half/step-siblings were not included in the study. The questionnaire was applied during a face-to-face interview by the researchers.

The survey questionnaire consisted of 4 main parts. The first part included items about socio-demographic characteristics. The second part was about the child with ASD (age, gender, severity of the disorder, accompanying disorders, etc) and their vaccine uptake. The third part aimed to evaluate the consecutive child's vaccination uptake, thus including questions about age, gender, any chronic disorders of the child, and the attitude of the parents towards the consecutive child's vaccination.

As the definition of VR includes 'refusal of vaccination despite the availability of vaccination services, only the vaccines that are included in the National Vaccination Program, and thus administered routinely were evaluated in the questionnaire, to ensure their availability. The vaccination uptake of the first child indicated the 'baseline' attitude of the parents for the childhood vaccines, while the consecutive sibling's uptake showed the 'current' attitude, after being a parent of a child with ASD. To have refused any (at least one) of the routinely administered vaccines was accepted as VR. Then, the study group was divided into 2 groups: Group 1 included parents who had developed VR in their current attitude although they were VR (-) in their

baseline attitude; Group 2 included parents who had accepted all vaccines in both baseline and current attitude. The parents who were VR (+)

in their baseline attitude were not included in the group comparisons. The schematic diagram of the study design is presented in Fig. 1.

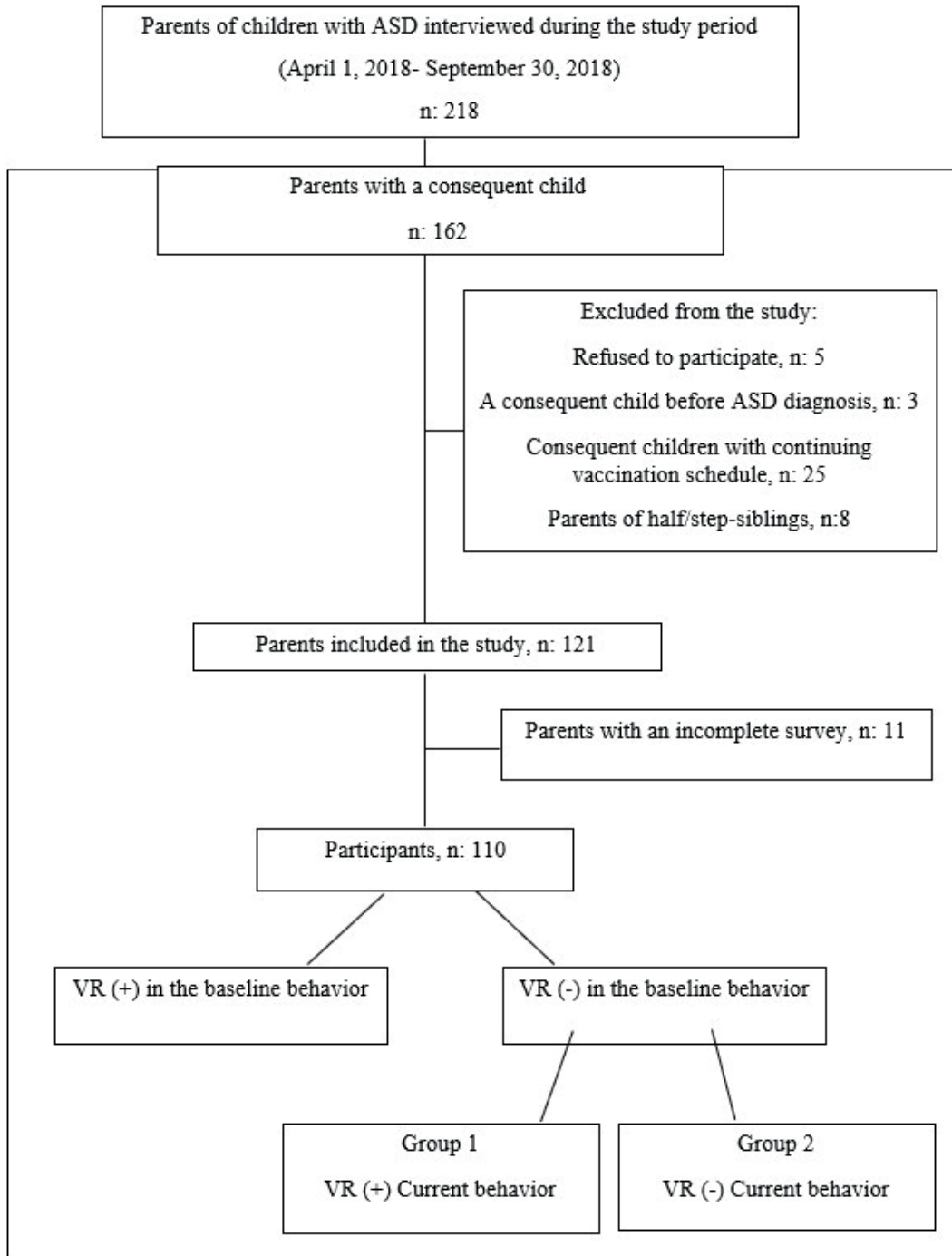


Fig. 1. The schematic diagram of the study design.

The fourth part of the questionnaire was designed to assess the parental concerns about childhood vaccines among all participants. This part included 5-Likert-type items (strongly agree, tend to agree, do not know, tend to disagree, strongly disagree) in addition to open-ended questions where appropriate. Their perception about ASD and relation to vaccines, and thoughts about VR were evaluated with Likert-type questions e.g. 'In my opinion, my child's autism is related to vaccines', 'Vaccine refusal threatens public health', 'In my opinion, parents have the right to refuse routinely administered vaccines'. The answers 'I strongly agree/tend to agree' were accepted to be consistent with the statement. The parents who assumed that their child's autism was related to vaccines were also asked about 'which vaccine' and/or 'which component of vaccine' and 'how' it caused autism (open-ended questions).

National Vaccination Program

The National Vaccination Program of Türkiye covers vaccination against diphtheria, tetanus, measles, rubella, mumps, tuberculosis, polio, chickenpox, hepatitis A, hepatitis B, invasive *Streptococcus pneumoniae*, and invasive *Haemophilus influenzae* type b in the first 2 years of life and continues with rappel doses in the following years. The current schedule is among the most comprehensive programs with 13 antigens since 2013 and has been updated in

2020 by the Ministry of Health.¹⁰ Table I presents the National Vaccination Program that was being held during the study period (01.04.2018-01.10.2018).

Statistical analyses

The data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 18.0). Categorical data were presented as percentages whereas numerical data with Gaussian distribution were presented as mean \pm standard deviation. The Chi-square or Fisher's exact test was used to compare proportions between groups where appropriate. The parameters that were found to be significant in developing VR by univariate analyzes were analyzed with logistic regression analysis. The p-value of <0.05 was considered statistically significant.

Results

The study group included 110 parents (88 mothers and 22 fathers) of 110 children with ASD (M/F:76/34; mean age: 7.2 ± 0.27 years) and 110 consecutive siblings (M/F:57/53; mean age 3.4 ± 0.16 years). The sociodemographic properties of the parents and clinical properties of the children are presented in Table II.

The prevalence of 'baseline' VR was 13% (14/110) in the study group whereas the

Table I. The National Vaccination Schedule of Childhood* during the first 2 years of age.

	Birth	1. month	2. month	4. month	6. month	12. month	18. month	24. month
Hepatitis B	I	II			III			
BCG			I					
DaPT-IPV-Hib			I	II	III		R	
PCV			I	II		R		
OPV					I		II	
MMR						I		
Varicella						I		
Hepatitis A							I	II

* The third dose of conjugated pneumococcal vaccine has been extracted from the schedule by January 2019, thus, the participants were expected to have administered the third dose, at 6 months of age.

BCG: Bacille Calmette Guérin vaccine, DaPT-IPV-Hib: Diphtheria, acellular pertussis, tetanus- Inactive polio vaccine-*Haemophilus influenzae* type b, PCV: Pneumococcal conjugate vaccine, OPV: Oral polio vaccine, MMR: Measles mumps rubella

Table II. The clinical and sociodemographic characteristics of the children and parents (n:110).

Mean age (mean±SD)	
Child with ASD	7.2±0.27
Younger sibling	3.4±0.16
Gender (M/F)	
Child with ASD	76/34
Younger sibling	57/53
Disorder severity of the child with ASD, n (%)	
Requiring support	39 (35)
Requiring substantial support	48 (43)
Requiring very substantial support	23 (20)
Additional diseases of the child with ASD, n (%)	
Mental disorders	46 (41)
Physical chronic disorders	8 (7)
Education level of the mother, n (%)	
Not educated	21 (19)
Elementary school	21 (19)
Middle school	22 (20)
High school	26 (23)
University	20 (18)
Education level of the father, n (%)	
Not educated	13 (11)
Elementary school	27 (25)
Middle school	23 (21)
High school	23 (21)
University	24 (22)
Marital status (Married/Single)	97/13
Socioeconomic status, n (%)	
Very low/low	45 (41)
Middle	23 (21)
High/very high	42 (38)

ASD: autism spectrum disorder

prevalence of 'current' VR was 40% (44/110) and the difference was statistically significant ($p<0.001$). The frequency of children with no vaccination was 28% (4/14) among baseline VR cases while 31% (14/44) among current VR cases ($p=0.8$).

Table III presents the factors related to developing VR in the study group. When we compared Group 1 (n:30) with Group 2 (n:66), the severity of ASD, additional diseases of both children, the gender of the sibling were similar between groups ($p=0.13$, $p=0.12$, $p=0.13$, respectively). However, the frequency of high-

income families in Group 1 was 63% while 27% in Group 2 ($p=0.001$). Moreover, the percentage of parents that graduated from high school and university in Group 1 (68%), was significantly higher than Group 2 (27%) ($p=0.02$). Only 21% of the parents in Group 1 attended regular well-child visits of the younger child, while the same it was 78% in Group 2 and the difference was significant statistically ($p=0.009$). The frequency of using new generation media as the main source of information about vaccines was significantly higher in Group 1 than in Group 2 (76% vs 23%; $p=0.006$). The risk ratios for independent variables show a significant

Table III. The factors related to developing vaccine refusal in the study group.

Total n:96	*Group 1 n: 30	**Group 2 n:66	p
Severe ASD [§] , n (%)	26 (86)	49 (74)	0.172
Having additional diseases, n (%)	13 (43)	19 (29)	0.16
Male gender (the sibling), n (%)	24 (80)	44 (66)	0.18
High/very high socioeconomic status, n (%)	19 (63)	18 (27)	0.001
High school and higher education level of the mother, n (%)	18 (60)	23 (35)	0.021
High school and higher education level of the father, n (%)	18 (60)	24 (36)	0.03
Regular well-child visits, n (%)	21 (70)	60 (90)	0.009
Using social media as the main source of information, n (%)	23 (76)	15 (23)	0.006

[§]Severe disease defines the group of children with ASD requiring substantial/very substantial support.

*Group 1 presents the participants who developed VR after being a parent of a child with ASD.

**Group 2 presents the participants who continued to accept all vaccines after being a parent of a child with ASD.

The parents who were VR (+) in their baseline attitude were not included in the group comparisons.

ASD: autism spectrum disorder, VR: vaccine refusal

difference for high-income families, using social media as the main source of information and lack of regular well-child visits of the sibling to develop VR (Table IV).

Opinions and parental concerns about childhood vaccines were evaluated among all participants. The frequency of parents who believe that their child’s autism is related to vaccines was 35%. But, when they were asked ‘which vaccine’ and/or ‘which component’ might have caused autism, 58% of them confessed that they did not know about this issue. Furthermore, 92% of them stated that they did not know ‘how?’ vaccines caused autism. Although 87% of participants were aware that VR poses a risk to public health, only 52% considered VR to be a “parental right.”

Discussion

The results of this study show that the attitudes of parents changed after becoming parents of children with ASD and the prevalence of VR increased among this susceptible population, affecting the vaccine uptake of the consecutive child. It was previously documented that families of children with ASD were less likely to vaccinate their consecutive children.^{7,8,11} But, the literature lacks the risk factors for developing VR among these families. Although it was previously reported that VR is also related to personal negative experiences,⁴ according to our results, the severity level of ASD, additional diseases of both children, the gender of the sibling did not affect the risk of developing VR in the study group. However, our results indicate that high-income, using social media as the main source of information and lack

Table IV. The risk factors of developing VR after being a parent of a child with ASD.

	B	SE	OR	%95 CI		P
				Lower	Upper	
High school and higher education level of the mother	1.70	1.09	5.48	0.64	46.80	0.12
High school and higher education level of the father	0.86	1.27	2.32	0.19	2.82	0.49
High/very high socioeconomic status	1.41	0.71	4.11	1.01	16.60	0.04
Using social media as the main source of information	1.94	0.78	7.02	1.52	32.49	0.01
Lack of regular well child visits of the sibling	3.25	0.93	25	4.11	166	0.001

ASD: autism spectrum disorder, B = Coefficient of regression, SE = Standard Error, OR = Odds Ratio, CI = Confidence Interval, VR: vaccine refusal

of regular well-child visits are risk factors to develop VR among parents of children with ASD. To the best of our knowledge, the current study is the first study to define the risk factors for developing VR among parents of children with ASD.

The relationship between socioeconomic status and vaccine acceptance is controversial. Although a previous systematic review reported lower vaccine uptakes in the general population with lower parental income and lower education level¹², Larson et al.¹³ have documented an emerging inverse relationship between vaccine uptakes and socio-economic status in their study conducted among 67 countries. According to our results, the rate of high-income families among participants who developed VR after becoming a parent of a child with ASD was significantly higher than the participants who were not; and this was found to be an independent risk factor for increasing VR in the study group.

Another issue about the global trend of VR is the effect of new generation media including social media. For an increasing number of people, the internet has become the most commonly used source of information about health protection and vaccines.¹⁴ Social media platforms are internet-based applications that enable users to create, interact with, and share content with others with multiple platforms for different types of content. In contrast to traditional media, social media allows individuals to share content rapidly and globally without editorial oversight.¹⁵ Furthermore, on social media, statements on health issues may have a similar effect whether they belong to a medical professional or someone who has no professional interest in health.¹⁶ In the literature, fake news and misinformation on social media have already been reported to be the main causes leading to increasing rates of vaccine hesitancy and VR.^{17,18} In addition, on social media, people come across various conspiracy theories about vaccines and may be convinced that alternative therapies instead

of modern medicine can provide them with better protection against diseases, as modern medicine is financed by pharmaceutical and vaccine companies.¹⁸⁻²⁰ Our results support the literature that using new generation media as the main source of vaccine information is a risk factor to develop VR in this susceptible population. However, the current study was conducted before the COVID-19 pandemic and presents the risk factors before the pandemic which has become the focus of our lives and intense social media discourse. The effect of the COVID-19 pandemic on the prevalence of VR for childhood vaccines and related factors has not been published yet. During the pandemic, childhood immunizations have been reported to be negatively affected due to the disruption to the delivery of vaccines globally rather than VR.²¹⁻²⁴ Bell et al.²⁵ have reported that most parents and guardians wanted to vaccinate their children during the pandemic although they experienced barriers that negatively affected their capability, motivation, and opportunity to vaccinate their children. Large population studies are necessary to evaluate the effects of the pandemic on VR rates regarding childhood vaccines.

When we evaluate the reasons from the participants' perspective, the most common reason to refuse the vaccines was the belief that they caused autism (63%), not surprisingly, but differing from the general population's perspective. Among them, 58% stated that they did not know 'which vaccine' and/or 'which component' might have caused. Furthermore, 92% of them stated that they did not know 'how?' vaccines caused autism. In the first report from our country about the intentions of childhood VR and hesitancy, Topçu et al.²⁶ reported that 12% of the participants stated that the reason for their refusal was the thought that vaccines caused autism. In a similar study evaluating the vaccine-related beliefs and practices among parents of children with ASD, Bazzano et al.²⁷ reported that the rate of the belief that vaccines caused autism was 48%. We believe

that evidence-based studies relating to ASD, their etiologic factors, and proven findings that vaccines are not associated with autism should be made public, and more readily available through social media as recently reported by Gabis et al.²⁸

Parents generally complained that it was difficult to find unbiased and balanced information on both the expected benefits and possible side effects of vaccines, and health professionals are reported to be important sources of information on vaccines.²⁹ Our results support the literature that suggests that regular well-child visits with enough time and balanced information about the vaccines may prevent VR. According to our results, the lack of regular well-child visits increases the risk of developing VR in the study group.

A limitation of this study is that it is based on parental reports instead of medical records, thus cannot exclude recall bias although we believe VR was a deliberate decision among the participants. Another limitation is that some parents who did not accept to participate in this study could be VR cases, who did not want to face or discuss this with a doctor, thus, the rate of VR among ASD parents may be higher than we report. A strengthening point of this study is that it includes not only the opinions but also the attitudes on vaccines related to the following child's vaccination.

In conclusion, the prevalence of VR is increasing among parents of children with ASD and their immunization practices change for the consecutive child. High socioeconomic level, lack of regular well-child visits, and using social media as the main source of information increase the risk of developing VR in this susceptible population. Health professionals should be aware of this risk and evaluate the vaccination uptake of the younger siblings of children with ASD more carefully. The main points to prevent VR among parents of children with ASD are regular well-child visits, adequate immunization information, and improved media literacy.

Ethical approval

The study was reviewed and approved by the Local Ethics Committee of Behçet Uz Children's Hospital on 08.03.2018 (Protocol no: 2018/196, Decision No: 2018/05-01) and participation involved informed consent.

Author contribution

The authors confirm contribution to the paper as follows: study conception and design: ÖB, SAG; data collection: SAG; analysis and interpretation of results: SAG, ÖB; draft manuscript preparation: ÖB, SAG. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. World Health Organization (WHO). Ten threats to global health in 2019. Available at: <https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019>
2. Dubé E, MacDonald NE. How can a global pandemic affect vaccine hesitancy? *Expert Rev Vaccines* 2020; 19: 899-901. <https://doi.org/10.1080/14760584.2020.1825944>
3. Dubé E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger J. Vaccine hesitancy: an overview. *Hum Vaccin Immunother* 2013; 9: 1763-1773. <https://doi.org/10.4161/hv.24657>
4. World Health Organization (WHO). Immunization, vaccines and biologicals: improving vaccine demand and addressing hesitancy. Geneva, Switzerland: WHO; 2019.
5. The Constitutional Court of the Republic of Türkiye. Halime Sare Aysal application. Available at: <https://kararlarbilgibankasi.anayasa.gov.tr/BB/2013/1789> (Accessed on May 7, 2018).

6. Gür E. Vaccine hesitancy - vaccine refusal. *Turk Pediatr Ars* 2019; 54: 1-2. <https://doi.org/10.14744/TurkPediatrArs.2019.79990>
7. Glickman G, Harrison E, Dobkins K. Vaccination rates among younger siblings of children with autism. *N Engl J Med* 2017; 377: 1099-1101. <https://doi.org/10.1056/NEJMc1708223>
8. Abu Kuwaik G, Roberts W, Zwaigenbaum L, et al. Immunization uptake in younger siblings of children with autism spectrum disorder. *Autism* 2014; 18: 148-155. <https://doi.org/10.1177/1362361312459111>
9. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Washington, DC: American Psychiatric Association; 2013.
10. Ministry of Health of the Republic of Türkiye. Aşılama Takviminde Değişiklik Yapıldı. Available at: <https://asi.saglik.gov.tr/asi-takvimi2>
11. Zerbo O, Modaresi S, Goddard K, et al. Vaccination patterns in children after autism spectrum disorder diagnosis and in their younger siblings. *JAMA Pediatr* 2018; 172: 469-475. <https://doi.org/10.1001/jamapediatrics.2018.0082>
12. Brown KF, Kroll JS, Hudson MJ, et al. Factors underlying parental decisions about combination childhood vaccinations including MMR: a systematic review. *Vaccine* 2010; 28: 4235-4248. <https://doi.org/10.1016/j.vaccine.2010.04.052>
13. Larson HJ, de Figueiredo A, Xiaohong Z, et al. The state of vaccine confidence 2016: global insights through a 67-country survey. *EBioMedicine* 2016; 12: 295-301. <https://doi.org/10.1016/j.ebiom.2016.08.042>
14. Tafuri S, Gallone MS, Cappelli MG, Martinelli D, Prato R, Germinario C. Addressing the anti-vaccination movement and the role of HCWs. *Vaccine* 2014; 32: 4860-4865. <https://doi.org/10.1016/j.vaccine.2013.11.006>
15. Puri N, Coomes EA, Haghbayan H, Gunaratne K. Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases. *Hum Vaccin Immunother* 2020; 16: 2586-2593. <https://doi.org/10.1080/21645515.2020.1780846>
16. Gerstenfeld PB, Grant DR, Chiang CP. Hate online: a content analysis of extremist internet sites. *Analyses of Social Issues and Public Policy* 2003; 3: 29-44. <https://doi.org/10.1111/j.1530-2415.2003.00013.x>
17. Harmsen IA, Mollema L, Ruiters RAC, Paulussen TGW, de Melker HE, Kok G. Why parents refuse childhood vaccination: a qualitative study using online focus groups. *BMC Public Health* 2013; 13: 1183. <https://doi.org/10.1186/1471-2458-13-1183>
18. Dubé E, Vivion M, MacDonald NE. Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: influence, impact and implications. *Expert Rev Vaccines* 2015; 14: 99-117. <https://doi.org/10.1586/14760584.2015.964212>
19. Smith N, Graham T. Mapping the anti-vaccination movement on Facebook. *Information, Communication & Society* 2017; 22: 1310-1327. <https://doi.org/10.1080/1369118x.2017.1418406>
20. Klimiuk K, Czoska A, Biernacka K, Balwicki Ł. Vaccine misinformation on social media - topic-based content and sentiment analysis of Polish vaccine-deniers' comments on Facebook. *Hum Vaccin Immunother* 2021; 17: 2026-2035. <https://doi.org/10.1080/21645515.2020.1850072>
21. Santoli JM, Lindley MC, DeSilva MB, et al. Effects of the COVID-19 pandemic on routine pediatric vaccine ordering and administration - United States, 2020. *MMWR Morb Mortal Wkly Rep* 2020; 69: 591-593. <https://doi.org/10.15585/mmwr.mm6919e2>
22. McDonald HI, Tessier E, White JM, et al. Early impact of the coronavirus disease (COVID-19) pandemic and physical distancing measures on routine childhood vaccinations in England, January to April 2020. *Euro Surveill* 2020; 25: 2000848. <https://doi.org/10.2807/1560-7917.ES.2020.25.19.2000848>
23. Nelson R. COVID-19 disrupts vaccine delivery. *Lancet Infect Dis* 2020; 20: 546. [https://doi.org/10.1016/s1473-3099\(20\)30304-2](https://doi.org/10.1016/s1473-3099(20)30304-2)
24. World Health Organization (WHO). WHO and UNICEF warn of a decline in vaccinations during COVID-19. Available at: <https://www.who.int/news/item/15-07-2020-who-and-unicef-warn-of-a-decline-in-vaccinations-during-covid-19>
25. Bell S, Clarke R, Paterson P, Mounier-Jack S. Parents' and guardians' views and experiences of accessing routine childhood vaccinations during the coronavirus (COVID-19) pandemic: a mixed methods study in England. *PLoS One* 2020; 15: e0244049. <https://doi.org/10.1371/journal.pone.0244049>
26. Topçu S, Almış H, Başkan S, Turgut M, Orhon FŞ, Ulukol B. Evaluation of childhood vaccine refusal and hesitancy intentions in Turkey. *Indian J Pediatr* 2019; 86: 38-43. <https://doi.org/10.1007/s12098-018-2714-0>
27. Bazzano A, Zeldin A, Schuster E, Barrett C, Lehrer D. Vaccine-related beliefs and practices of parents of children with autism spectrum disorders. *Am J Intellect Dev Disabil* 2012; 117: 233-242. <https://doi.org/10.1352/1944-7558-117.3.233>
28. Gabis LV, Attia OL, Goldman M, et al. The myth of vaccination and autism spectrum. *Eur J Paediatr Neurol* 2022; 36: 151-158. <https://doi.org/10.1016/j.ejpn.2021.12.011>
29. Ames HM, Glenton C, Lewin S. Parents' and informal caregivers' views and experiences of communication about routine childhood vaccination: a synthesis of qualitative evidence. *Cochrane Database Syst Rev* 2017; 2: CD011787. <https://doi.org/10.1002/14651858.CD011787.pub2>