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RESEARCH ARTICLE / *ARAŞTIRMA MAKALESİ*

Immunization Status in Children with Cerebral Palsy and Their Household Members, and Parental Beliefs and Attitudes About Childhood, Adulthood, and COVID-19 Immunizations

Serebral Palsili Çocukların ve Hane Halklarının Aşılanma Durumları ve Ebeveynlerinin Çocukluk Çağı, Erişkin ve COVID-19 Aşılarıyla İlgili Düşünce ve Tutumları

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ABSTRACT

Objective: To assess the immunization rate of the vaccines included in the Turkish National Immunization Program (NIP) among children with cerebral palsy (CP) and their households and to analyze parental beliefs and knowledge about vaccines and attitudes toward childhood, adult, and COVID-19 immunizations.

Material and Methods: This descriptive cross-sectional study included children aged 3-10 years with a diagnosis of spastic CP. The initial face-to-face interview with parents of children collected data on their children's immunization rates, beliefs, and knowledge about vaccines, and parents were given information about adult immunization. Approximately one year after the initial interview, mothers were interviewed by telephone about the immunization rates of mothers, fathers, and grandparents and their COVID-19 vaccine acceptance or hesitancy. Numbers and percentages were presented as descriptive statistics.

Results: Sixty-eight child-parent pairs participated in the first interview, and 67 mothers participated in the second interview. According to NIP, all children with CP and their siblings had been fully vaccinated on time. 70.6% of mothers had a positive belief toward childhood immunizations. None of the parents knew about optional childhood or adult immunizations. None of the parent and grandparent pairs had been vaccinated with vaccines included in the national adult immunization schedule. None of the 64 parent pairs who accepted to receive adult vaccines during the initial interview received the vaccines. 17.9% of parent pairs were detected to have COVID-19 vaccine hesitancy or refusal.

Conclusion: National health policies for adult immunization should be developed to provide immunization to households with chronically ill children.

Keywords: Cerebral palsy, child, COVID-19, households, immunization

ÖZ

Amaç: Serebral palsili çocuklarda ve hanehalklarında Türkiye Ulusal Bağışıklama Programında (UBP) yer alan aşılarla aşılanma oranının değerlendirilmesi ve ebeveynlerinin aşılarla ilgili düşünce ve bilgilerinin ve çocukluk, erişkin ve COVID-19 aşılamalarına ilişkin tutumlarının incelenmesi.

Gereç ve Yöntem: Bu çalışma, spastik serebral palsi (SP) tanılı 3-10 yaş arası çocukları içeren tanımlayıcı bir kesitsel çalışmaydı. SP'li çocukların ebeveynleri ile yapılan ilk yüz yüze görüşmede, çocuklarının aşılanma oranları ile aşılarla ilgili düşünce ve bilgilerine ilişkin veriler toplandı ve ebeveynlere erişkin aşılanması hakkında bilgi verildi. İlk görüşmeden yaklaşık bir yıl sonra annelerle, annelerin, babaların ve büyükanne ve büyükbabaların aşılarını yaptırma oranları ve COVID-19 aşı kabulleri veya kararsızlıkları hakkında telefonla görüşüldü. Sayı ve yüzdeler tanımlayıcı istatistikler olarak sunuldu.

Bulgular: İlk görüşmeye 68 çocuk-ebeveyn çifti, ikinci görüşmeye 67 anne katıldı. UBP'ye göre, tüm SP'li çocuklar ve kardeşleri zamanında tam olarak aşılanmıştı. Annelerin %70,6'sı çocukluk çağı aşılarına karşı olumlu bir düşünceye sahipti. Ebeveynlerin hiçbiri isteğe bağlı çocukluk çağı veya erişkin aşılarını bilmiyordu. Ebeveyn ve büyükanne ve büyükbaba çiftlerinden hiçbiri, ulusal erişkin aşı şemasında yer alan aşılarla aşılanmamıştı. İlk görüşme sırasında aile sağlığı merkezlerinde erişkin aşılamasını kabul eden 64 ebeveyn çiftinin hiçbiri, sonraki bir yıl içinde, aşılamayı yaptırmadı. Ebeveyn çiftlerinin %17,9'unda COVID-19 aşı kararsızlığı veya reddi olduğu saptandı.

Sonuç: Kronik hastalığı olan çocukların hanehalklarında bağışıklamayı sağlamak için erişkin aşılamasına yönelik ulusal sağlık politikaları geliştirilmelidir.

Anahtar Kelimeler: Serebral palsi, çocuk, COVID-19, hanehalkı, aşılama

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INTRODUCTION

Children with chronic medical conditions are at comparable risk for vaccine-preventable diseases to the healthy population and are vulnerable to complications from vaccine-preventable infectious diseases. Immunization at the earliest possible age is essential for these vulnerable children (1,2). However, it has been reported that children with chronic neurological disorders have lower immunization rates and miss or postpone vaccines (3-6). A recent multicenter study in Turkey found that children with cerebral palsy (CP) had lower immunization rates and incomplete immunization programs. The authors determined that the children with completed immunization schedules were Bacillus Calmette-Guérin (BCG, 90.8%), hepatitis B (HepB, 88.9%), oral polio (88.5%), and measles-mumps-rubella (MMR, 77.3%). The diphtheria-tetanus-acellular pertussis (DTaP), inactivated polio, hemophilus the influenza type B, and pneumococcal conjugate vaccines were administered in ≤60% of patients. For pneumococcal vaccines, 15.2% of children were not fully vaccinated for their age, and influenza vaccine was administered to only 3.4% at any time (7).

The current literature on the immunization status of households with children with CP is sparse. Khan et al. (8) reported that immunization coverage among mothers of children with CP was significantly lower than the national coverage in rural Bangladesh. Immunization coverage of all households should be determined because parents were defined as the most common source of pertussis, followed by siblings, whereas 54.1% of children with the chronic neurological disease were found to have antibody titers below those required to prevent pertussis infection (3,9). Therefore, full immunization in all households would increase the health benefits of immunization by reducing or preventing the transmission of such diseases.

The coronavirus disease 2019 (COVID-19) pandemic has reminded us that outbreaks of vaccine-preventable diseases can threaten the health of communities worldwide and that vaccination is the most effective approach to protect individual and community health. On the contrary, in many countries and Turkey, the number of childhood immunizations decreased during the COVID-19 pandemic (10-12). To promote immunization activities and continuously provide immunization to children, parents' beliefs and attitudes about immunization should be heard (13).

This study aimed to determine the immunization rate of the vaccines included in the Turkish National Immunization Program (NIP) among children with spastic CP and their households. In addition, the main objective of the present study was to analyze parental beliefs and knowledge about childhood vaccines, optional childhood vaccines, adult vaccines, and parental COVID-19 vaccines and attitudes toward adult and COVID-19 immunizations.

METHODS

Study design and participants

A descriptive cross-sectional study was conducted at University Hospital of Mersin. Children with spastic CP and their parents constituted the study subject group. The three- to ten-year-old children who had been diagnosed with spastic CP by a pediatric neurologist were included. Patients diagnosed with dyskinetic or ataxic CP and other neuromuscular disorders except CP were excluded. All parents gave written informed consent, and the local ethics committee approved this study (MEU; 2020/311). Sociodemographic variables and clinical characteristics of the index child were queried with the structured questionnaire.

Data collection

The study's primary endpoint was to determine the immunization rate of the vaccines included in the Turkish Childhood NIP (Table 1) among children with spastic CP and their siblings and to assess parental beliefs about childhood immunization. For this endpoint, face-to-face interviews were conducted with both parents between July 1 and August 31, 2020, at a hospital during general pediatric care. Childhood immunization cards and/or e-Nabız records (e-Nabız is a personal health record system in which the Turkish Ministry of Health has integrated all information systems of all health facilities) provided by parents served as evidence of childhood immunization. Information on adverse events after immunization and medical advice on childhood immunization was recorded as information given by parents and/or as accessible hospital records. Parents were asked whether they knew about optional childhood vaccines and the national adult immunization schedule. Meningococcal conjugate and serogroup B vaccines were recommended for index children, and parents were asked whether they accepted or refused optional meningococcal vaccines. Information provided by parents included an assessment of the immunization status of parents, grandparents, and siblings. Parents were advised

Table 1: Turkey's national immunization program

Childhood vaccination[a]	Hep B_1 within 1 day; Hep B_2 within 1 month; BCG, $PCV13_1$, DaPT-IPV-Hib_1 within 2 months; $PCV13_2$, DaPT-IPV-Hib_2 within 4 months; Hep B_3, DaPT-IPV-Hib_3, OPV_1 within 6 months; $PCV13_{booster}$, MMR_1, $Varicella_1$ within 12 months; DaPT-IPV-$Hib_{booster}$, OPV_2, Hep A_1 within 18 months; Hep A_2 within 24 months; DaPT-$IPV_{booster}$, MMR_2, within 48 months; $Td_{booster}$ within 13 years
Adult vaccination	Three primary doses plus booster dose of Td; two primary doses of MMR; Td and inactivated influenza vaccine for pregnant women; PCV13 and inactivated influenza vaccine for 65 years of age and older; Td and MMR for private soldiers
Optional vaccination	Rotavirus, meningococcal, human papilloma virus, and influenza

[a] National immunization program (NIP) included most of these vaccines as of the year of 2008 while Hep A was included in 2012 and Varicella was included in 2013. In this study, "complete" and "incomplete" vaccinations were defined considering whether the vaccine was available in the NIP during children's immunization period.

to be vaccinated for diphtheria-tetanus toxoid (Td) and MMR, which are administered free of charge by the Turkish Ministry of Health at health facilities, and parents were asked whether they accepted or refused adult immunization. If the response was "yes," they were asked whether they preferred receiving the vaccines at their family health center or our hospital. Mothers were asked an open-ended question about what first came to mind about childhood immunizations, and their responses were divided into two categories: (i) positive beliefs about vaccines and (ii) negative beliefs about vaccines. BCG scar was checked in the index child and both parents, and the presence of BCG scar in the sibling(s) was noted as information from the mothers.

The secondary endpoint of the study was to determine the rate of vaccinated adults among parents who had accepted to be vaccinated at the initial interview and to examine COVID-19 vaccine acceptance and hesitancy. For this endpoint, telephone interviews with mothers were conducted approximately one year after the initial interview, between June 28 and 30, 2021. Mothers were asked whether they and their husbands had been vaccinated for Td and/or MMR at their family health center. If the response was "no," they were asked another open-ended question about the reason for not being vaccinated. An inactivated SARS-CoV-2 vaccine (Sinovac) has been available in Turkey since January 14, 2021, and an mRNA-based SARS-CoV-2 vaccine (Pfizer-BioNTech) since April 2, 2021. They will be administered to groups in the order of priority determined by the Turkish Ministry of Health. Starting June 25, 2021, all persons 18 years of age and older in Turkey will be eligible for immunization against COVID-19. We asked about COVID-19 history in index children and households and the COVID-19 immunization status of parents. Attitudes toward COVID-19 immunization were asked among unvaccinated parents. Attitudes toward COVID-19 immunization among their children with CP, when immunization was recommended for chronically ill young children, were also recorded.

Sample size calculation and statistical analysis

Based on hospital records, the total number of children aged ≤10 years with spastic CP who presented to the general pediatric outpatient clinic for 3-month follow-up was 80 (22-35/month). Because the expected frequency of children's immunization status was unknown, we used 50% for prevalence to calculate the sample size. Based on these data (population size (N): 80; predicted prevalence % (p): 50; confidence limits as +/- percent of 100 (d): 5; and design effect: 1.0), the minimum sample size was calculated to be 67 at a confidence interval of 95% using the "OpenEpi Calculator"

(https://www.openepi.com/SampleSize/SSPropor.htm).

The SPSS software program (version 21.0. Armonk, New York: IBM Corp.) was used for statistical analysis. Numbers and percentages were presented as descriptive statistics.

RESULTS

Sixty-eight child-parent pairs participated in the first interview, and 67 mothers participated in the second interview. The mean age of children with spastic CP was 6.5±1.8 years. The median (min-max) age at diagnosis of CP was 9.5 (2-36) months. 79.4% had at least one comorbid condition, and six children had extended family with grandparents older than 65 years. The sociodemographic and clinical characteristics of the study subjects are shown in Table 2.

Table 2: Sociodemographic and clinical characteristics (n=68)

Children with cerebral palsy	
Age, years	6.5±1.8
Gender, male	36 (52.9)
Type of cerebral palsy	
Spastic quadriplegia	37 (54.4)
Spastic diplegia	19 (27.9)
Spastic hemiplegia	12 (17.7)
GMFCS	
II	16 (23.5)
III	8 (11.8)
IV	13 (19.1)
V	31 (45.6)
Age at diagnosis of cerebral palsy, months	9.5 (2-36)
Type of delivery, cesarean	51 (75.0)
Gestational age, preterm birth	40 (58.8)
Gestational age, weeks	35 (25-40)
Birth weight, grams	2322±1006
Doctor who regularly sees the child	
Pediatric neurologist	35 (51.5)
Physiatrist	15 (22.1)
Pediatrician	8 (11.8)
Family physician	8 (11.8)
No regular follow up care	2 (2.9)
Having sibling(s)	59 (86.8)
Household members	
Parental age, years	
Maternal	34.7±5.2
Paternal	39.2±5.9
Maternal education	
≤8 years	49 (72.1)
>8 years	19 (27.9)
Paternal education	
≤8 years	39 (57.4)
>8 years	29 (42.6)
Family structure	
Nuclear	58 (85.3)
Single parent	4 (5.9)
Extended	6 (8.8)
Number of family members	4 (2-10)
Number of child(ren) in the family	2 (1-8)
Income level	
Low	33 (48.5)
Middle	25 (36.8)
High	10 (14.7)

GMFCS; Gross Motor Function Classification System. Results are expressed as mean ± standard deviation, median (min-max interval) and number (percentage).

According to NIP, all children with CP had received timely complete vaccines, and only one patient had received an optional MenACWY vaccine. None of the children had received MenB, rotavirus, or influenza vaccine. Two mothers had been counseled by their children's pediatric neurologist and pediatrician about childhood immunizations and vaccine safety; therefore, these two physicians had advised the mothers to obtain consent to vaccinate their children for CP according to NIP. None of the parents knew about optional childhood vaccines or national adult immunization schedules. According to self-report data, 83.8% of mothers had been vaccinated during pregnancy, and 36.8% of fathers had been vaccinated during military service. The vaccine that the mothers had received during pregnancy was the Td vaccine, and none of the mothers refused to receive this vaccine. Eleven mothers had not received the Td vaccine during pregnancy because they were not interested (16.2%). Sixty-five pairs of parents accepted adult immunization (Td and MMR), and three refused. One of the pairs who accepted to be vaccinated received Td and MMR vaccines on the same day at our hospital. The parents who refused to be vaccinated stated that there was no risk for them to get a vaccine-preventable disease; therefore, adult immunizations were unnecessary. All parents accepted the offer of counseling for meningococcal immunization of the index child. The characteristics of the immunizations are shown in Table 3.

Table 3: Immunization characteristics (n=68)

Children with cerebral palsy	n (%)
Vaccination, complete	68 (100.0)
History of adverse event following immunization	13 (19.1)
Fever	11 (16.2)
Pain, swelling, redness	2 (2.9)
Receiving consultancy from own doctor about vaccination	2 (2.9)
BCG scar	68 (100.0)
Household members	
Maternal immunization history for vaccination in	
Infancy	NA
Childhood/school age	35 (51.5)
Pregnancy	57 (83.8)
Paternal immunization history for vaccination in	
Infancy	NA
Childhood/school age	32 (47.1)
Soldiery	25 (36.8)
Sibling's vaccination status, complete	102 (100.0)
Parental acceptance the offer of adult vaccination	65 (95.6)
in family health center	64 (94.1)
in Mersin University Hospital	1 (1.5)
Parental refusing adult vaccination	3 (4.4)
Parental acceptance the offer of child's meningococcal vaccination	68 (100.0)

BCG; Bacillus Calmette-Guérin, NA; not available.

According to the self-reported data, 83.8% of mothers and 8.8% of fathers had received the Td vaccine in the past decade. One mother with asthma had received annual influenza immunization, and one father who works in health care as a healthcare professional had received three doses of the HepB vaccine. The immunization status of the households is presented in Table 4.

Regarding beliefs about immunization, 70.6% of mothers had positive beliefs about childhood immunization. The most common positive belief was the effectiveness of vaccines in preventing certain diseases. However, the most common negative belief was that vaccines were inappropriate for preventing diseases, as shown in Table 5.

Table 5: Maternal beliefs about childhood vaccines (n=68)

	n (%)
Positive beliefs	48 (70.6)
Childhood vaccines are necessary and safe	1 (1.5)
Vaccines improves the immune system and growth	6 (8.8)
Childhood vaccines are effective and prevent certain diseases	41 (60.3)
Negative beliefs	20 (29.4)
Children get too many vaccines during the early childhood	2 (2.9)
Childhood vaccines are not necessary	4 (5.9)
Vaccinations may cause diseases	4 (5.9)
Some vaccines have ingredients that are unsafe	4 (5.9)
Vaccines do not certainly prevent diseases	6 (8.8)

Table 4: Vaccination status of household members

	Maternal (n, %)	Paternal (n, %)	Grandparental (n, %)
Td vaccine in the last 10 years	57/68 (83.8)	6/68 (8.8)	0
Three doses of HepB vaccine	0	1/68 (1.5)	0
At least one dose of MMR vaccine	0	0	0
Annual influenza vaccine	1/68 (1.5)	0	0
BCG scar	62/68 (91.2)	64/68 (94.1)	NA
COVID-19 vaccine	32/67 (47.8)	38 /67 (56.7)	7/7 (100.0)
Pfizer-BioNTech vaccine	26	29	0
Sinovac vaccine	6	9	7

Td: tetanus-diphtheria, HepB: hepatitis B, MMR: measles-mumps-rubella, BCG: Bacillus Calmette-Guérin, NA: not available.

One mother could not be reached by telephone for the second interview. During the first interview, none of the 64 pairs of parents who had agreed to receive adult vaccines at their family health center received the vaccines. Fourteen mothers (21.9%) reported that they did not have time to receive an adult vaccine shot, while 50 mothers (78.1%) reported that they avoided going to the family health center during the COVID-19 pandemic. According to the self-reports, two-parent pairs and one mother had COVID-19 in 2021, two mothers and three fathers had COVID-19 in 2020, and 59 parent pairs (88.1%) had no COVID-19 history. One child with CP and her 9-year-old brother had a COVID-19 history. All grandparents in the household had received two doses of the Sinovac vaccine. While thirty-one pairs of parents (46.3%) had received the first dose of the COVID-19 vaccine, twenty-eight pairs of parents (41.8%) had not yet received the COVID-19 vaccine. Ten of them had already made an appointment for the first dose of the COVID-19 vaccine and were willing to be vaccinated. Ten unvaccinated parent pairs (14.9%) were hesitant about receiving the COVID-19 vaccine, and two-parent pairs (3%) reported that they refused to be vaccinated. The attitudes of unvaccinated parents toward COVID-19 immunization are shown in Table 6. In addition, all mothers indicated that they were hesitant about COVID-19 immunization for their children with CP when immunization is recommended for chronically ill young children. All mothers indicated that they are also hesitant to vaccinate their healthy children with the COVID-19 vaccine because they believe COVID-19 vaccines have unsafe ingredients.

Table 6: Attitudes towards COVID-19 vaccination in unvaccinated parents

	Mothers (n=35)	Fathers (n=29)
Already booked COVID-19 vaccination appointment and will be vaccinated	13	10
Hesitant due to think of COVID-19 vaccines have ingredients that are unsafe	10	10
Not vaccinated because of being too busy to get a COVID-19 shot	3	4
Will be vaccinated after the period required for COVID-19 recovery	2	2
Not vaccinated because of being pregnant	1	-
Not vaccinated because of being lactating mother	1	-
Not vaccinated because of having needle phobia	1	-
Not vaccinated because of immobilization due to fractured foot	1	-
Will be vaccinated when Turkey's homegrown vaccine is ready for use	1	1
Refused to take the vaccine due to think of COVID-19 vaccines have severe side effects	2	2

Results are expressed as number.

DISCUSSION

In the present study, we investigated the immunization rate of the vaccines included in the Turkish Childhood NIP in children with spastic CP. We found no unvaccinated, partially vaccinated, or delayed vaccinated children with spastic CP. The immunization rate of children with spastic CP also appears to be a based on our results. Turkey's overall immunization rate for major infectious diseases was 98% in 2018 and ≥ 95% in 2019 (14).

Dinleyici et al. (3) reported that 95.6% of 366 Turkish children with chronic neurological disorders had received age-appropriate childhood immunizations, according to NIP. The diagnosis of severe forms of epilepsy or autism spectrum disorders in children has been associated with inadequate or late immunization compared to the general population (3, 15, 16). The present study's sample was a homogeneous group of children with the primary diagnosis of CP. Therefore, the fact that children with a major diagnosis of other neurological disorders were not included could be related to the higher immunization rate observed in our study. An Australian study showed that children with CP had lower immunization rates and missed vaccines than the general population, according to a 2008 database (4). From 2008 to 2020, the global DTP3 immunization rate (83%) remained unchanged, but Turkey's administrative DTP3 immunization rate increased to 99% (17). Since 2010, the administration of childhood vaccines has been one of the indicators for the pay-for-performance of family physicians in Turkey. Moreover, Turkish parents love their disabled children and follow physicians' advice (18). These facts could have ensured absolute immunization rates among Turkish children with CP. A study from Bangladesh highlighted that 91.7% of children with CP had a BCG scar, an objective indicator of immunization at birth. The study reported that only 43.2% of children with CP had been vaccinated for the rubella vaccine during the 2014 rubella immunization campaign in Bangladesh. The authors emphasized that the time of CP diagnosis was an independent predictor of immunization coverage; children diagnosed before the age of three were more likely to have received the rubella vaccine (6). Our study also showed that the age at diagnosis of CP was ≤ 3 years in all children and all were fully vaccinated. A recent study from Turkey suggested that the frequency of incomplete/no routine immunizations, except pneumococcal immunization, is higher in patients with severe motor dysfunction than in CP children with mild to moderate motor dysfunction (CP) (7). In our study, all children at each level of the Gross Motor Function Classification System (GMFCS) were fully vaccinated, possibly because there were no contraindications to vaccines and no history of serious adverse events after immunization in the participants in this study.

A study assessing the immunization of mothers of children with CP in rural Bangladesh found that 2% of them received a HepB vaccine and 6% received an influenza vaccine during the prenatal period (8). In Turkey, it was reported that 7.4% of households with children with chronic neurological disorders

had a history of receiving seasonal influenza vaccine (3). In this study, only one mother had a history of receiving the annual influenza vaccine, and none of the household at-risk groups received the pneumococcal vaccine. Findings from Bangladesh and Turkey suggest that immunization of households with children with CP may be overlooked in low- to middle-income countries. In 2019, influenza and pneumococcal immunization rates among ≥ 65-year-old healthy subjects in Turkey were 8.2% and 0.2%, respectively; immunization rates among Turkish adults with the chronic obstructive pulmonary disease were 37.9% and 13.3%, respectively (19,20). These rates suggest that treating parents/grandparents necessitate developing awareness of the risk for transmission of vaccine-preventable diseases among households and preventive strategies to protect both themselves and their children/grandchildren. Although we informed parents about the need for adult/older adult immunizations, none of the parents/grandparents received the recommended vaccines. For this reason, we propose to develop national health policies for adult immunization to strictly control the immunization of households with chronically ill children.

In rural Bangladesh, the overall coverage for at least two doses of tetanus toxoid in mothers of children with CP was well below the national tetanus coverage (8). According to 2020 WHO data, the tetanus toxoid immunization rate among pregnant women in Turkey was 66.7% (21). In this study, the rate of mothers who have received the Td vaccine in the past ten years was 83.8%, including the pregnancy of the index child. Unawareness of the need, timing, and resources of Td immunization during pregnancy was the most common reason given by unvaccinated Turkish women (22). Another reason for non-immunization for Td was lack of interest, while immunization was not refused. Hence, interest and knowledge about the importance of immunization during pregnancy should be encouraged.

A previous study reported that a third of Turkish parents were completely unaware of optional childhood vaccines (23). In this study, parents were not adequately informed by healthcare professionals about optional childhood vaccines, and none of the children with CP received the full series of optional childhood vaccines. In Turkey, the influenza vaccine was never recommended for 93.9% of children with CP (7). The percentage of Turkish family physicians and pediatricians who recommend the meningococcal conjugate vaccine to their patients was given as 57.5% and 71.2%, respectively (24). We determined that this percentage was 0% among the physicians when the patient was a child with CP. To this end, Turkish healthcare professionals should be made aware of the recommendation of optional childhood immunizations for children with CP.

A study reflecting the demographic situation in Turkey found that 6.6% of those over the age of 18 do not consider immunization beneficial, and 6.2% have never been vaccinated (25). In this study, the proportion of mothers who had a negative belief about vaccines was 29.4%. Nevertheless, all mothers had their children vaccinated. The immunization refusal rate among adults was 4.4%, while the acceptance rate of a child's optional vaccine was 100%. These results may indicate that vaccine hesitation or refusal is not currently a threat to the health of children with CP. National health policies should address negative beliefs about vaccines to prevent negative beliefs from developing into negative attitudes and anti-vaccination.

A previous study from Turkey showed that reminding grandparents of pneumococcal immunization during visits to a well-child clinic increased immunization coverage in the elderly (26). In this study, immunization rates did not increase among either parents or grandparents after interviews, including informing parents about the need for adult immunizations. It is important to note that this study was conducted during the coronavirus pandemic and parents reported that they avoided visiting healthcare facilities during the pandemic period. Therefore, under normal circumstances, further prospective interventional studies should investigate whether recommendations to vaccinate parents and grandparents of children with CP at follow-up would increase the immunization rate in adulthood.

The COVID-19 pandemic has underlined the importance of immunization. But even after the outbreak of COVID-19, the hesitancy and refusal to be vaccinated remained unbroken (27). Distrust of vaccine safety has been found to be the most critical factor in hesitancy to be immunized for COVID-19 (28). The most common reasons for refusing COVID-19 immunization in Turkey were anxiety about vaccine side effects, lack of knowledge about vaccine effectiveness, and distrust of foreign vaccines (29). The results of our study on attitudes toward COVID-19 immunization among hesitant and refusing parents confirm the existing literature.

The present study concluded that none of the mothers were willing to vaccinate their children against COVID-19. However, it has been reported that CP is associated with an increased risk of COVID-19 hospital admissions and death (30). Therefore, healthcare providers should consider increasing COVID-19 vaccine acceptance rates in children with CP.

One limitation was that this was a single-center study with a descriptive cross-sectional design, so the power in terms of national representativeness may have been low. Another limitation of the study was the lack of a control group. Accordingly, the results were discussed by comparing them with the results of previous studies. Results were based on self-reports, so they may not reflect actual household immunization status. There may have been a bias in remembering parental immunizations. Selection bias was also possible since the children were admitted to the general pediatric outpatient clinic between the end of the first and the beginning of the second wave of COVID-19 in Turkey.

In summary, this study examined the immunization status of children with CP and their households. Parents of children with spastic CP seem willing to have their children timely and fully vaccinated, even if they have negative beliefs about vaccines. Healthcare providers should address negative beliefs about

vaccines to prevent negative beliefs from developing into negative attitudes and anti-vaccination. In addition, national health policies for adult immunization should be designed to strictly manage the immunization of households with chronically ill children.

Etik Komite Onayı: Bu çalışma yerel etik kurul (ÇŞB; 2020/311) tarafından onaylanmıştır.

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Hakem Değerlendirmesi: Dış bağımsız.

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