PARENTS' VIEWS AND INFORMATION STATUS ON CHILDHOOD VACCINES: WHICH MYTHS PLAY A ROLE

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SUMMARY

Objectives: The participation of families in childhood vaccination decreases slightly every year around the world. Parents arrive at a decision that vaccines are not safe for their children due to many sources of misinformation. The aim of this study was to investigate the relationship between vaccine hesitancy, vaccine knowledge status and socio-demographic characteristics of the children's parents.

Methods: In this cross-sectional study, 361 parents of children aged 5 years and under, who were admitted to our paediatric outpatient clinic, were included. The parents received scores between 0–20 points according to the correct answers they gave to the questions asked.

Results: Although all parents had a positive attitude towards vaccination, some myths, e.g. that vaccination could weaken the child's immune system because it contains heavy metals which could cause infertility and that complementary and alternative medicine could replace vaccination, are thought to be real by 1.7% to 34.6% of the parents.

Conclusions: Since the presence of misinformation may lead to vaccine hesitancy and incomplete vaccination, healthcare personnel have important duties and responsibilities for this group.

Key words: child, knowledge, vaccines

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INTRODUCTION

Thanks to the Expanded Programme on Immunization (EPI), which the World Health Organization (WHO) has been implementing since 1974, significant reductions are observed in the incidence, mortality and morbidity of vaccine-preventable diseases. With the initiation of EPI after the eradication of smallpox in 1980, immunization rates have increased rapidly, which is felt more pronounced in developing countries. Although this programme aims to immunize at least 80% of infants against vaccine-preventable diseases in the first stage, its principle is to completely eradicate vaccine-preventable diseases by increasing immunization rates to 95% (1). In addition to many diseases that can be prevented by vaccination in children, the contribution of vaccines to individual and social health in the long term is of great importance. For example, congenital rubella syndrome, which may develop in a newly born baby when transmitted to a pregnant woman; complications of measles virus, such as subacute sclerosing panencephalitis (SSPE), which appears 10–20 years later after infection and damages the nervous system, have been reduced by vaccination. Despite such advantages, participation of families in childhood vaccination decreases slightly every year around the world, and the belief that alternative and complementary medicine is more effective becomes gradually more popular with different concerns that vaccines may have side effects on children or restrain their mental development (2, 3). In recent years, especially in developed countries, the hesitant approach to vaccines has increased so much that, according to a study conducted in the United States, the ratio of families who had no worries about childhood vaccination was only 23% (4). The level of information about vaccines and the source of information undoubtedly play an active role in the hesitation of families. Development of technology, widespread use of social media and the internet provide easy access to information but correctness of this information obtained is controversial. Parents decide that vaccines are not safe for their children due to many sources of misinformation (5, 6).

The aim of our study was to investigate the relationship between vaccine hesitancy, vaccine knowledge status, attitudes towards vaccines and the socio-demographic characteristics of the parents of the children admitted to our hospital.

MATERIALS AND METHODS

Study Region and Population

This cross-sectional study was planned in Kars, a city in the northeast Turkey. The Ministry of Health of Turkey has divided the country into 30 regions according to health. Kars is in the northeast

Anatolia sub-region 2 (NEA-2), which is the least developed one and has been reported to be below Turkey's average level in terms of the indicators for education and healthcare services. Regarding health care, Kars ranks 68th; regarding educational level, it ranks 59th among the 81 cities in Turkey.

Study Sample

The study sample consisted of the parents of the children aged 5 years and under who were admitted to our paediatric outpatient clinic between 1 January 2019 and 31 December 2019. All the parents gave consent to participate in the study. The formula of $n = Nt^2pq/(d^2(N-1) + t^2pq)$ was used to calculate the sample size (7). The number of applications was used to determine the size of the sample by deducting the repeated admissions from the previous year. After this deduction, the total number of admissions of children aged 5 years and under between 1 January 2018 and 31 December 2018 was 5,938. According to this, when the prevalence is taken as 50%, the confidence interval as 95% and the sampling error as 5%, the sample size to be reached representing the universe was calculated as 361 parents. After the approval was obtained from the local Ethics Committee (No. 81829502.903/27 of 31 January 2019), 361 parents with children aged 5 years and under, who agreed to participate in the study, were included. The vaccine knowledge test consists of 20 questions. The three options to each question are yes, no and I do not know. Each correct answer is worth 1 point, and the other answers are worth 0. According to the answers they gave, the participants scored between 0–20 points. After the scoring, parents who scored 10 points and less were grouped as a low knowledge group, while those who scored 11 points and more were grouped as a high knowledge group.

Study Variables

Dependent variables were knowledge and attitude towards childhood vaccines.

Independent variables include age, gender, age of marriage, first pregnancy age, total number of children, presence of consanguineous marriage, number of households, family type, place of residence, parents' education level, parents' working status, parents' income level, presence of social security, distance of household to health institutions, perspectives on vaccination and their reasoning, and information source. Distance to health institution were near – patients can arrive at the health institution in 15 minutes or less; middle 15–30 minutes; and far – more than 30 minutes.

Two forms were prepared to collect the necessary data for the research. While the first form includes the socio-demographic and socioeconomic characteristics of the parents, the second form was prepared by researchers who scanned articles on the subject for the measurement of the vaccine knowledge status (8–10). In the second form, answers to the 2nd, 3rd, 8th and 12th questions were scored as 1 point if the answer was 'yes' and 0 points if the answer was 'no' or 'I do not know'. If the participant could not answer the 8th question correctly, the answer to the 9th question was evaluated as incorrect. The parents were asked to give an example for the 12th question if their answer was 'yes'. The answer was considered as 'I don't know' if the parents said "fever occurs for 1–2 days after vaccination", remained silent or could not give an answer such as "can be seen after BCG and polio vaccines"(Table 4). Data were collected using a face-to-face interview technique.

Statistical Methods

The Statistical Package for the Social Sciences (SPSS) 22.0 software was used for the statistical analysis of the data. Frequencies and percentages were used in the descriptive table, the chi-squared test was used for binary comparisons (at the significance level of $p < 0.05$). Further analyses were performed using the binary logistic regression model.

RESULTS

A total of 361 parents were included in this study. The level of vaccine knowledge was higher in parents with a non-consanguineous marriage (55.6%) compared to those with a consanguineous marriage (26.4%) ($p=0.001$). The level of knowledge was higher in those living in urban areas (58.0%) compared to those living in rural areas (22.2%) ($p=0.001$). The level of knowledge was significantly higher in those with a maternal education level of high school and above (66.5%) compared to those with a maternal education level of secondary school and below (34.5%) ($p=0.001$). Those with a paternal education level of 9 years and above (58.3%) had significantly higher knowledge level than those with a paternal education level of 8 years and below (35.8%) ($p=0.001$). Mothers who had a regular job (75.6%) had higher knowledge than those who had no regular job (39.6%) ($p=0.001$). Fathers who had a regular job (50.9%) had higher knowledge than those with no regular job (27.9%) ($p=0.005$). Families with a high level of income (60.3%) had higher vaccine knowledge than those who did not have a sufficient income (42.0%) and those who had just sufficient income (42.6%) ($p=0.006$). Those who were far from the healthcare institution (36.7%) had lower knowledge than those who were close to the healthcare institution (47.1%) and those who had a medium distance to the healthcare institution (66.7%). All 361 parents who participated in the study expressed a positive view on vaccines. The number of children (2 children and less) of parents with a higher level of knowledge (53.2%) was lower than the number of children (3 children and more) of those with a lower level of knowledge (40.6%) ($p=0.019$). The number of household members (4 persons and less) of parents with a higher level of knowledge (58.9%) was lower than the number of household members (5 persons and more) of those with a lower level of knowledge (40.5%) ($p=0.001$) (Table 1). There was no significant difference between a vaccine knowledge level and gender, family type and social security ($p=0.598$, $p=0.335$, $p=0.914$, respectively).

The marriage age of the parents with a higher level of knowledge (22.26 ± 3.80) was higher than the marriage age of those with a lower level of knowledge (20.72 ± 3.86) ($p=0.001$). The first pregnancy ages (22.94 ± 3.76) of the parents with a higher level of knowledge were higher than those with a lower pregnancy ages (21.32 ± 3.24) ($p=0.001$) (Table 2). No significant difference was found between the vaccine knowledge level and the age of the parents ($p=0.179$).

Table 3 shows the results of the binary logistic regression analysis. According to the table, when a rural settlement is taken as reference, the vaccine knowledge level of urban residents is 4.292

Table 1. *Distribution of parents' level of knowledge according to socio-demographic and socioeconomic status (N = 361)*

		Vaccine knowledge score		p-value
		10 points and less (%)	11 points and more (%)	
Gender	Female	169 (51.4)	160 (48.6)	0.598
	Male	18 (56.3)	14 (43.8)	
Relationship between parents	Yes	67 (73.6)	24 (26.4)	0.001
	No	120 (44.4)	150 (55.6)	
Family type	Nuclear	120 (50.0)	120 (50.0)	0.335
	Extended	67 (55.4)	54 (44.6)	
Number of children	2 children and less	102 (46.8)	116 (53.2)	0.019
	3 children and more	85 (59.4)	58 (40.6)	
Number of household members	4 persons and less	62 (41.1)	89 (58.9)	0.001
	5 persons and more	125 (59.5)	85 (40.5)	
Residential area	Rural	77 (77.8)	22 (22.2)	0.001
	Urban	110 (42.0)	152 (58.0)	
Mother's educational status	8 years and less	135 (65.5)	71 (34.5)	0.001
	9 years and more	52 (33.5)	103 (66.5)	
Father's educational status	8 years and less	104 (64.2)	58 (35.8)	0.001
	9 years and more	83 (41.7)	116 (58.3)	
Mother's regular income-generating business	Yes	21 (24.4)	65 (75.6)	0.001
	No	166 (60.4)	109 (39.6)	
Father's regular income-generating business	Yes	156 (49.1)	162 (50.9)	0.005
	No	31 (72.1)	12 (27.9)	
Level of income	Not enough	40 (58.0)	29 (42.0)	0.006
	Just enough	101 (57.4)	75 (42.6)	
	Comfortable enough	46 (39.7)	70 (60.3)	
Social security	Yes	167 (51.7)	156 (48.3)	0.914
	No	20 (52.6)	18 (47.4)	
Distance to health institution	Near	92 (52.9)	82 (47.1)	0.001
	Middle	26 (33.3)	52 (66.7)	
	Far	69 (63.3)	40 (36.7)	
View on childhood vaccines	Positive	187 (51.8)	174 (48.2)	
	Negative	0	0	
Total		187 (51.8)	174 (48.2)	

Table 2. *Evaluation of parents' information status according to their socio-demographic status (N = 361)*

	Vaccine knowledge score		p-value
	10 points and less (n = 187) Mean (SD)	11 points and more (n = 174) Mean (SD)	
Age	30.75 (8.06)	29.76 (5.60)	0.179
Marriage age	20.72 (3.86)	22.26 (3.80)	0.001
Age at the time of the first pregnancy	21.32 (3.24)	22.94 (3.76)	0.001

times higher (CI: 1.944–9.478); when mothers with an education level of secondary school and below are taken as reference, the vaccine knowledge level of mothers with an education level of high school and above is 3.379 times higher (CI: 1.644–6.946); when mothers with no regular income-generating job are taken as reference, the vaccine knowledge level of mothers with a regular job is 2.487 times higher (CI: 1.259–4.914); when the distance of the family to the healthcare institution is taken as reference, the vaccine knowledge level of those close to the healthcare institution is 2.219 times higher (CI: 1.105–4.455), and the vaccine

Table 3. *Binary logistic regression analysis results*

		Vaccine knowledge score					
		B	SE	Wald	p-value	Odds ratio	95% CI
Residential area	Urban	1.457	0.404	12.989	0.001	4.292	1.944–9.478
	Rural					1.000 (Reference)	
Mother's educational status	High school and above	1.218	0.368	10.974	0.001	3.379	1.644–6.946
	Middle school and below					1.000 (Reference)	
Mother's regular income-generating business	Yes	0.911	0.347	6.874	0.009	2.487	1.259–4.914
	No					1.000 (Reference)	
Distance to health institution	Near	0.797	0.356	5.026	0.025	2.219	1.105–4.455
	Middle	0.974	0.415	5.515	0.019	2.649	1.175–5.972
	Far					1.000 (Reference)	
Number of children	2 children and less	0.020	0.358	0.003	0.956	1.020	0.505–2.058
	3 children and more					1.000 (Reference)	
Number of household members	4 persons and less	0.187	0.388	0.233	0.629	1.206	0.564–2.577
	5 persons and more					1.000 (Reference)	
Father's educational status	9 years and more	0.251	0.354	0.501	0.479	1.285	0.642–2.572
	8 years and less					1.000 (Reference)	
Father's regular income-generating business	Yes	0.206	0.454	0.206	0.650	1.229	0.505–2.990
	No					1.000 (Reference)	
Level of income	Comfortable enough	0.591	0.473	1.562	0.211	1.806	0.715–4.563
	Just enough	−0.101	0.332	0.093	0.761	0.904	0.472–1.732
	Not enough					1.000 (Reference)	
Relationship between parents	No	0.685	0.349	3.845	0.050	1.983	1.000–3.932
	Yes					1.000 (Reference)	
Marriage age		−0.008	0.103	0.006	0.937	0.992	0.81–1.214
Age at the time of the first pregnancy		−0.034	0.102	0.108	0.743	0.967	0.791–1.182

knowledge level of those at a medium distance to the healthcare institution is 2.649 times higher (CI: 1.175–5.972).

Of the parents, 75 (20.8%) indicated television as their source of information, 32 (8.9%) indicated the internet, 5 (1.4%) indicated newspapers, 18 (5.0%) indicated books, 300 (83.1%) indicated healthcare personnel, and 34 (9.4%) indicated neighbours, friends or relatives. The evaluation of the information status and perspectives of parents about childhood vaccines is given in Table 4.

DISCUSSION

Most mothers participating in this study had an education level of secondary school and below (57.1%), and most fathers graduated from high school and above (55.1%). Those with non-consanguineous marriage (74.8%) and who were urban settlers (72.6%) constituted the majority. The participating mothers were mostly housewives (76.2%), and fathers had regular jobs (88.1%); 100% of the parents had a positive view about vaccinations in childhood. In recent years, parents' rates of not having their children vaccinated with their consent and signatures have been increasing (11). In December 2017, the Turkish Ministry of Health initiated intensive studies when the number of families who had refused vaccination reached 23,600 and created the 'everything about vaccines' – vaccine portal site.

In our study, healthcare personnel (83.1%) were found as the most frequent source of information about vaccines. This was followed by television with 20.8%. In a study conducted in Malatya, 151 parents refused childhood vaccinations and their reasons were examined. Only 25% of the parents gained their information from healthcare personnel (12). We can easily say that healthcare personnel have a key role in raising public awareness about vaccination. In our study, it is also significant that all parents had a positive attitude towards vaccines and indicated healthcare personnel as their source of information. However, the role of healthcare personnel is also important as the vaccine hesitancy increases day by day. In their studies on vaccines, Bond and Nolan as well as Bond et al. stated that although mothers expressed different concerns in making the vaccine decision, one of the most important obstacles was the weakness of communication with healthcare personnel (13, 14).

In our study, there was a significant difference between the level of parental education, regular income and job status and the level of vaccine knowledge. Increased level of vaccine knowledge was positively correlated with increased parental education and regular income-generating jobs. In another study conducted in Diyarbakır, the rate of unemployed mothers was 96.9%, and the

Table 4. *Evaluation of parents' information status and perspectives about childhood vaccines (N = 361)*

	Yes n (%)	No n (%)	Not know n (%)
1 Are childhood vaccines paid?	11 (3.0)	345 (95.6)	5 (1.4)
[a]2 If a vaccination cannot be done or is disrupted, can the vaccination be continued later, or can it be resumed?	185 (51.2)	100 (27.7)	6 (21.1)
[a]3 Are there any studies that prove the efficacy and safety of vaccines?	132 (36.6)	55 (15.2)	174 (48.2)
4 Does applying multiple vaccines simultaneously weaken the child's immune system?	123 (34.1)	143 (39.6)	95 (26.3)
5 Does applying multiple vaccines simultaneously reduce the effect of the vaccines?	32 (8.9)	137 (37.9)	192 (53.2)
6 Does applying multiple vaccines simultaneously increase the effect of the vaccines?	58 (16.1)	155 (42.9)	148 (41.0)
7 Do vaccines cause long-term damage to the body?	32 (8.9)	269 (74.5)	60 (16.6)
[a]8 Are there any heavy metals in vaccines?	82 (22.7)	104 (28.8)	175 (48.5)
[b]9 If so, are these heavy metals capable of having toxic effect on the body?	23 (6.4)	32 (8.9)	306 (84.8)
10 Do vaccines interfere with human DNA and change their genetics?	32 (8.9)	154 (42.6)	175 (48.5)
11 Do vaccines lead to diseases such as asthma, diabetes, cancer?	23 (6.4)	185 (51.2)	153 (42.4)
[a]12 Can the vaccine itself cause the disease it is supposed to prevent?	62 (17.2)	222 (61.5)	77 (21.3)
13 Do vaccines cause autism?	6 (1.7)	184 (50.9)	171 (47.4)
14 Do vaccines cause infertility?	32 (8.9)	192 (53.1)	137 (38.0)
15 Do vaccines cause sudden infant death?	46 (12.8)	168 (46.5)	147 (40.7)
16 Is the immunization gained by getting infected more robust than vaccination?	109 (30.2)	177 (49.0)	75 (20.8)
17 In diseases protected by vaccines, do antibiotics compensate vaccination?	32 (8.9)	288 (79.7)	41 (11.4)
18 Does complementary or alternative medicine compensate vaccines?	34 (9.4)	299 (82.8)	28 (7.8)
19 Does breastfeeding compensate vaccines?	72 (20.0)	265 (73.4)	24 (6.6)
20 Does natural immunity compensate vaccines?	55 (15.2)	270 (74.8)	36 (10.0)

[a]In 2nd, 3rd, 8th and 12th questions, the answer 'yes' is worth 1 point, 'no' and 'I do not know' is rated 0 point.
[b]The wrong answer to the 8th question and not knowing answer to this question was considered as wrong for the 9th question.
Parents who responded 'yes' to the 12th question were asked to give an example. It was evaluated as unknown if the parent could not give the answer "visible after BCG or polio vaccines".

rate of illiterate mothers was 62.3% (15). In the same study, 157 (44.9%) of the fathers of the children with missing vaccines were reported to be unemployed or self-employed, while 121 (34.7%) of the fathers of fully vaccinated children were unemployed or self-employed. There are many studies with similar results in the literature (12, 16–18).

In the study of Babadağlı (19), a significant relationship was found between incomplete vaccination and the lack of social security. In the study of Kurçer et al. (20) in Şanlıurfa, it was stated that the rate of vaccination decreased due to long distances to the health institutions and having temporary jobs. In the study of Yiğitalp et al. (15), it was found that social security was ineffective in the incomplete vaccination status. In our study, the distance to healthcare institution and social security did not affect the level of vaccine knowledge. While the health policies developed over the years can be effective in this situation, the fact that most parents included in this study live in urban settlements can explain this situation.

In recent years, vaccine hesitancy has been seen as an important step in the path to vaccine rejection, and this is increasing steadily (8). Although all the parents participating in this study stated that they had a positive view about vaccination, the questions that measured their vaccine knowledge level also included their point of view for vaccination and vaccine hesitancy. While 34.1% of the parents thought that receiving multiple vaccines at the same time would weaken the child's immune system, 22.7% said that vaccines contained heavy metals, and 6.4% thought that these metals could have toxic effects; 8.9% of the participants stated that vaccines may be associated with infertility, and 1.7% stated that vaccines may be associated with autism. These rates were found to be higher in parents who refused childhood vaccinations. In the study of Gökçe et al. (12), the entire study group stated that vaccines can harm the immune system of children, 71% of the study group believed that vaccines caused infertility and 31% believed that vaccines caused disorders such as mental retardation. In the study of Burghouts et al. (9), the leading causes of vaccine rejection are possible side effects and the notion that multiple doses are unnecessary. In the study of Attwell et al. (10), it was noteworthy that families of unvaccinated children stated that their children's immunity was better and that families described vaccinated children as unhealthy; 9.4% of the parents stated that alternative and complementary medicine could replace vaccines and 20.0% said that breastfeeding could replace vaccines. In a study in Australian families who rejected or postponed all or some vaccines, complementary medicine methods were considered as more natural and safer with no chemicals and with less side effects by families, and these were the leading reasons for vaccine rejection (21). In another study on 492 families, the rate of vaccine hesitancy was 52%, but the most important underlying causes were alternative medicine methods (OR: 1.71–25.00) and

the idea that vaccines were not safe (OR: 1.00–7.76); 63.4% of the families responded 'no' or 'I do not know' to the question: "Are there studies demonstrating the efficacy and safety of vaccines?" (22). This may be related to the educational status of the families and the fact that they did not need to research it since they had a positive view about it. In a study from Nigeria, it is reported that vaccine hesitancy was negatively related with vaccination knowledge and the education level of mothers in rural areas (23).

Since our study was conducted at a single centre in Kars, it only provides an insight into the vaccination knowledge levels of the parents of children aged 5 years and under who were admitted to the paediatric outpatient clinic and does not reflect the views of all parents in the community.

CONCLUSIONS

In conclusion, we can say that parental education should be increased to improve vaccine knowledge levels. Even parents who state that they have a positive attitude towards vaccines may have hesitations. Healthcare personnel have a key role and informative television broadcasts are important for public education about vaccines. Therefore, healthcare personnel should inform the public more about vaccines, including those who administer vaccination. Vaccination hesitancy is reduced when the mothers' education level is high school and above. Educational policies should prioritize women. As vaccination level increases and hesitations against vaccines are eliminated, vaccination rates are expected to increase, and the mortality and morbidity of preventable diseases will be reduced.

Conflict of Interests
None declared

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