

Evaluation of Family Medicine Residents Knowledge Levels, Attitudes and Behaviors About Rotavirus Infection and Vaccines

Aile Hekimliği Asistanlarının Rotavirüs Enfeksiyonu ve Aşıları Hakkındaki Bilgi Düzeyleri, Tutum ve Davranışlarının Değerlendirilmesi

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ABSTRACT

Objective: In children under 5 years of age, vaccines developed against rotavirus (RV) infection, one of the most important viral diarrhea agents, prevent hundreds of thousands of deaths. The short time interval in which the vaccine can be given and the fact that it is not included in the national vaccination calendar impose a special responsibility on family physicians. The aim of this study was to evaluate the level of knowledge, attitudes, and behaviors of family medicine residents about RV infection and RV vaccines and to update the educational content with these data.

Material and Methods: With the permission of the Ethics Committee of Adana City Training and Research Hospital (ACTR), the study was conducted with the family medicine residents of ACTR hospital. Demographic data of the participants, their attitude towards the RV vaccine, and 22 questions measuring the level of knowledge about RV infection and vaccines were collected, and the data obtained were analyzed.

Results: The study included 106 participants, 48.1% of whom were women. The mean age of the participants was 30.69 ± 3.87 years and the mean duration of practice was 5.59 ± 3.55 years. While 80.2% of the participants stated that they had previously experienced a patient with RV infection, 85.8% said that they recommended RV vaccination to families. The mean correct response of the participants to the 22-item questionnaire measuring their knowledge was 14.98 ± 3.51 . The knowledge level of the participants who stated that they had sufficient knowledge about RV, and recommended RV vaccine to families, was significantly higher than that of the other participants.

Conclusion: RV vaccine, which significantly reduces the incidence and severity of RV-associated gastroenteritis, hospitalization rate, and disease-related mortality, is not currently included in the national vaccine program and is not yet adequately applied despite its proven efficacy and safety. The data obtained in the study revealed the necessity to emphasize issues such as the route of administration, doses, time of administration, contraindications, and use of RV vaccines together with other vaccines to be included in the prepared training program.

Keywords: Rotavirus vaccine, family medicine, gastroenteritis

ÖZ

Amaç: Beş yaş altı çocuklarda en önemli viral ishal etkenlerinden olan rotavirüs (RV) enfeksiyonuna karşı geliştirilen aşılar yüzbinlerce ölümü engellemektedir. Aşının uygulanabileceği zaman aralığının kısıllığı ve ulusal aşı takviminde bulunmaması aile hekimlerine özel bir sorumluluk yüklemektedir. Bu çalışmanın amacı aile hekimliği asistanlarının RV enfeksiyonu ve RV aşıları hakkındaki bilgi düzeylerini, tutum ve davranışlarını değerlendirmek ve bu verilerle eğitim içeriklerini güncellemektir.

Gereç ve Yöntemler: Adana Şehir Eğitim ve Araştırma Hastanesi (AŞEAH) Etik Kurulu'ndan alınan izin ile AŞEAH aile hekimliği asistanları ile gerçekleştirilmiştir. Katılımcıların demografik verileri, RV aşısına karşı tutumu ve 22 sorudan oluşan RV enfeksiyonu ve aşıları hakkındaki bilgi düzeyini ölçen sorular yöneltilerek elde edilen veriler analiz edildi.

Bulgular: Çalışma %48,1'i kadın olan 106 katılımcı dahil oldu. Katılımcıların yaş ortalaması $30,69 \pm 3,87$ iken ortalama hekimlik süresi $5,59 \pm 3,55$ yıl olarak gözlemlendi. Katılımcıların %80,2'si daha önceden RV enfeksiyonu ile karşılaştığını belirtirken, %85,8'i ise ailelere RV aşısını önerdiğini söyledi. Katılımcıların 22 maddeden oluşan ve bilgilerini ölçen ankete verdikleri doğru yanıt ortalaması $14,98 \pm 3,51$ olarak saptandı. RV hakkında yeterli bilgi düzeyi olduğunu belirten ve ailelere RV aşısı önerdiğini belirten katılımcıların bilgi düzeyi, diğer katılımcılara göre anlamlı ölçüde yüksek saptandı.

Sonuç: Rotavirüse bağlı gastroenterit sıklık ve şiddetini, hastaneye yatış oranını, hastalığa bağlı mortalitye önemli ölçüde azaltan RV aşısı ulusal aşı programında hâlihazırda bulunmaması nedeniyle oldukça etkin ve güvenilirliği kanıtlanmış olmasına rağmen henüz yeterince

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Received: 08.12.2024 **Accepted:** 27.01.2025 **Publication Date:** 28.02.2025

Cite this article as: Karataş S, Tunay M. Evaluation of family medicine residents knowledge levels, attitudes and behaviors about rotavirus infection and vaccines. J Eur Med Sci. 2024;5;(2):45-51



ÖZ

uygulanmamaktadır. Çalışmada elde edilen veriler hazırlanacak eğitim programında RV aşılarının uygulama yolu, dozları, uygulama zamanı, kontrendikasyonları, diğer aşılarda birlikte kullanımı gibi konularını vurgulanması gerekliliğini ortaya koymuştur.

Anahtar Kelimeler: Rotavirüs aşısı, aile hekimliği, gastroenterit

INTRODUCTION

Family medicine is an open and unlimited entry point for those seeking health care. The relationship of trust that physicians have with their patients through repeated contact creates a unique opportunity for the delivery of preventive health services. Vaccinations are one of the most important forms of preventive health care. Family physicians have personal education, immunization, hygiene, and diagnosis and treatment responsibilities, not only for individual patients but also for this disease, which concerns public health and can rapidly cause epidemics. Family physicians have a great responsibility for rotavirus (RV) infection, which can be prevented by vaccination today and which frequently causes severe dehydration in children under 5 years of age, according to World Health Organization (WHO) data (1).

RV are non-enveloped, double-stranded, RNA viruses belonging to the family Reoviridae. In the literature, 10 different RV types are classified from A to J according to VP6 sequence and antigenic differences. Type A roRV are the most common cause of childhood infections, while there are geographical differences between strains (2-4). RV infect intestinal enterocytes. Epithelial cell interactions with the virus, malabsorption secondary to enterocyte damage, villus ischemia and released vasoactive agents play a role in pathophysiology (5). A decrease in intestinal enzymes including maltase, sucrase, and lactase occurs with acute infection. This leads to malabsorption and transport of an osmotically active food bolus into the large intestine, resulting in osmotic diarrhea occurs (6,7). The incubation period of the disease is 1-3 days, and symptoms start suddenly following this period. The onset of the disease occurs with vomiting followed by secretory diarrhea. Approximately one-third of the patients may also have a fever that accompanies the symptoms. In the presentation of the disease, diarrhea without blood and mucus is yellow-green. Symptoms may last for 1 week (8,9). In the diagnosis of RV, a RV antigen can be found in stool samples using Enzyme-Linked Immunosorbent Assay (ELISA) or immunochromatography. One of the most commonly used tests in daily practice is the stool ELISA test (2,10). The main aim in the treatment of RV infection is to correct fluid loss and electrolyte disturbance, and to ensure adequate hydration and nutrition. Treatment should be given to alleviate dehydration symptoms. Specific antiviral treatment for RV is not available. Dehydration should be prevented with oral rehydration solutions, but if oral treatment is not possible, hospitalization and intravenous hydration should be considered. Most patients admitted to outpatient clinics and emergency departments

can be discharged with oral rehydration solutions (11). Rarely progressing from isolated form to systemic infection, RV may also cause neurologic pictures including meningitis, encephalitis and seizures (2).

RV, which has the potential to cause disease even with low viral load, can remain viable on surfaces for a long time and is contagious even during asymptomatic periods of the disease. It is an infectious agent that is difficult to protect against using only general hygiene rules, although it is transmitted via the fecal-oral route. In 2016, it was reported to cause 258 million cases of diarrhea and more than 128 thousand deaths in children under 5 years of age (12). The high mortality rate of the disease has led to vaccine development efforts, and two types of RV vaccines that are widely used today have been included in the national vaccination schedule in some countries. The pentavalent human-bovine reassortant RV vaccine (Rotateq) was licensed in 2006 and is used in 3 doses, while the monovalent human RV (Rotarix) vaccine was licensed in 2008 and is used in 2 doses. Both oral vaccines are used in our country (13-15). As of 2020, 107 countries have included the RV vaccine in their national vaccination calendars, preventing 30,000 deaths each year (16).

In this study, the study aimed to evaluate the level of knowledge, attitudes, and behaviors of family medicine residents about RV vaccines and infection, which are not yet included in the national vaccination calendar and whose efficacy and safety have been proven.

MATERIALS and METHODS

Study Type

Before the study was started, written permissions were obtained from the administrations of the universities whose students were included in the study sample. The approval of the Clinical Research Ethics Committee of Adana City Training and Research Hospital has been obtained (decision number: 2527, date: 27.04.2023).

Our cross-sectional study was conducted between 01.05.2023-31.06.2023 with 106 family medicine residents working in ACTR hospital.

Study Group

The population of the research consisted of 141 family medicine residents working in the ACTR hospital. In the calculation made with the Epi-Info statistical program, the sample size was found to be 103 people with 80% power, 95% confidence interval, and 5% margin of error. Residents who agreed to participate and completed the consent form

were included in the study; participants who did not agree to participate or later withdrew consent were excluded.

Procedures

In the questionnaire, 33 questions were asked to measure the demographic data of the participants, their thoughts about RV infection, and their level of knowledge about vaccines. The first 6 questions of the questionnaire were about demographic data, the next 5 questions were about attitudes, behaviors, and disease experience, and the remaining 22 questions measured the level of RV knowledge. The answers were coded and the data obtained were analyzed. Some questions (16, 17, 21, 23, 25, 31, 33) were reverse coded. In statistical analysis, item difficulty index, item discrimination, and reliability of the questions were analyzed. Cronbach's Alpha value was calculated (0.721). The 22 questions used in our study were included due to their item discrimination power, validity and reliability. The calculated item difficulty index and item discrimination of the questions in the prepared scale were evaluated (Table 1).

Statistical Analysis

SPSS version 23.0 statistical software was used to analyze the data obtained. Descriptive statistics related to the socio-demographic characteristics of the participants were calculated. Student's t-test was used for two-group comparisons of normally distributed parameters, and the Mann-Whitney U test was used for two-group comparisons of non-normally distributed parameters. For comparisons of numerical data between more than two groups, the Kruskal Wallis test was used for those not showing normal distribution. Categorical data were compared by the chi-square test. Pearson correlation analysis was used to evaluate the relationships between numerical data. The p-value <0.05 was considered statistically significant.

RESULTS

48.1% of the participants were female. The mean age was 30.69 ± 3.87 years; 66 percent were married and 34 percent had children. The mean duration of medical practice was 5.59 ± 3.87 years, and the mean duration of residency was 2.57 ± 1.22 years. 80.2% of the participating physicians had previously diagnosed patients with RV, and there was no statistical difference between the mean scores of the knowledge questions compared to the group of physicians who had not previously diagnosed patients with RV ($p > 0.05$). The rate of those who thought that RV vaccine should be included in the national vaccination schedule was 91.5%, and there was a statistically significant difference between the mean scores of those who answered no to this question and those who answered yes ($p < 0.05$) (Table 2). The proportion of those who thought that they had sufficient information about RV vaccines was 45.3%. There was no statistically significant difference, 3%, between the group who answered no to this question and the mean scores of the answers given to the questions prepared about RV infection and vaccine ($p > 0.05$). While the rate of physicians who routinely recommended the RV vaccine to families was 85.3%, a statistically significant difference was observed in the mean scores of the answers given to the questions prepared about RV infection and vaccine between the group who did not recommend it ($p < 0.05$) (Table 2).

Participants were asked 22 questions about RV infection and vaccination. The 5 questions with the most correct answers were RV may cause diarrhea, nausea, vomiting, dehydration and electrolyte abnormalities. The main goal in the treatment of RV infection is to correct fluid loss and electrolyte disturbance and to ensure hydration and nutrition. Sanitation and hygiene reduce the likelihood of transmission. RV is one of the most important causes of diarrhea that can lead to

Table 1. According to the answers to the questions related to rotavirus infection and vaccines item Discrimination Index (rjx) and item Difficulty Index (Pj)

Question number	pj	rjx	c%	Question number	pj	rjx	c%
1	0.67	0.11	66.98	12	0.6	0.39	60.38
2	0.75	0.11	75.47	13	0.86	0.24	85.85
3	0.95	0.04	95.28	14	0.19	0.2	18.87
4	0.99	0.02	99.06	15	0.58	0.43	58.49
5	0.94	0.06	94.34	16	0.58	0.43	57.55
6	0.33	0.19	33.02	17	0.58	0.46	57.55
7	0.97	0.04	97.17	18	0.79	0.33	75.47
8	0.75	0.09	75.47	19	0.72	0.28	71.70
9	0.98	0.04	98.11	20	0.1	0.15	10.38
10	0.86	0.17	85.85	21	0.57	0.3	56.60
11	0.65	0.3	65.09	22	0.57	0.37	56.60

rjx: Discrimination Index, Pj: Difficulty Index

death in young children and infants. RV is transmitted through blood. The questions with the least correct answers were RV vaccines are absolutely contraindicated in severe combined immunodeficiencies. RV vaccines cannot be administered simultaneously with parenteral or nasal vaccines. RV occurs frequently in the summer season in our country. Rotarix® is a pentavalent human bovine reassortant vaccine while Rotateq® is a monovalent human RV vaccine. Since Rotateq® contains latex, Rotarix® should be preferred for those with latex allergy (Table 3).

The score on the knowledge questions about RV infection and vaccines was 14.98 ± 3.51 . There was a weak negative correlation between the knowledge scores of the physicians in the study group about RV infection and vaccines and the duration of their residency ($r = -0.215$, $p = 0.027$). There was no correlation between the knowledge scores of the physicians

regarding RV infection and vaccines and the duration of residency ($r = 0.135$, $p = 0.168$).

DISCUSSION

In our study, the average correct response rate to questions about RV infection was 84.27%. The level of knowledge of family medicine residents about the disease seems to be sufficient. In the study by Yıldız (17) this rate was found to be 84.27% in family physicians, while in this study, a relationship was found between specialty training, vaccination status of their own children, and knowledge level. In the Avcı (18) study, physicians who thought that they had sufficient knowledge about RV had a significantly higher mean response rate. A similar relationship was not found in our study. Studies in the literature conducted with nurses show that the rates of

Table 2. Participants' RV experience, attitudes and mean knowledge scores

	n	(%)	Mean ± SD	P
Have you ever seen a rotavirus infected patient?				
No	21	19.8	14.38±2.94	0.385
Yes	85	80.2	15.12±3.64	
Should rotavirus vaccine be on the routine vaccination schedule?				
No	9	8.5	13.81±3.39	0.001
Yes	97	91.5	16.39±3.14	
Do you think you have the adequate level of knowledge about rotavirus vaccine?				
No	58	54.7	13.22±3.52	0.117
Yes	48	45.3	15.14±3.48	
Do you recommend rotavirus vaccine to families?				
No	15	14.2	13.20±2.51	0.011
Yes	91	85.8	15.27±3.58	

RV: Rotavirus, SD: Standard deviation, n: Number

Table 3. The questions that the participants answered most and least correctly

The number of correct answers, (n%)		RV infection & vaccine knowledge level items
105	99.06	RV may cause diarrhea, nausea, vomiting, dehydration and electrolyte abnormalities.
104	98.11	The main goal in the treatment of RV infection is to correct fluid loss and electrolyte disturbance and to ensure hydration and nutrition.
103	97.17	Sanitation and hygiene reduce the likelihood of transmission.
101	95.28	RV is one of the most important causes of diarrhea that can lead to death in young children and infants.
100	94.34	RV is transmitted through blood.
60	56.60	RV vaccines are absolutely contraindicated in severe combined immunodeficiencies.
60	56.60	RV vaccines cannot be administered simultaneously with parenteral or nasal vaccines.
35	33.02	RV occurs frequently in the summer season in our country.
20	18.87	Rotarix® is a pentavalent human bovine reassortant vaccine while Rotateq® is a monovalent human RV vaccine.
11	10.38	Since Rotateq® contains latex, Rotarix® should be preferred for those with latex allergy.

RV: Rotavirus, n: Number

pre-education knowledge were below 50% and increased to 90% and above after the education programs (19,20). Many studies show that a higher number of correct answers were given to questions about the clinical aspects of RV gastroenteritis.

The low rate of correct answers to the question about the time of onset of RV enteritis is noteworthy. Only 33% of physicians answered this question correctly. The fact that most gastroenteritis is seen in the summer may have led to confusion. Dinç et al. (21) in our country, the most common months of RV enteritis were reported as winter. It was observed that marital status, having children, and gender of the physicians participating in our study had no effect on RV knowledge. This situation was found to be different from previous studies in the literature. The main reason for this may be the difference between the study populations. Since the population in our study received a medical education, they had more knowledge about RVs infection and vaccines than the participants from the general public (22).

The prevalence of the disease in our country was demonstrated within the scope of the Turkish demographic and health survey. It was found that 23% of children under the age of five had diarrhea in the last 2 weeks before the survey period. This rate is higher in children younger than 6 months and older than 23 months (23). In our study, we observed a negative correlation between the increase in the professional duration of physicians and the level of knowledge (24). It is thought that the inconsistency between the findings of our study and the literature stems from the type and quality of postgraduate education (24). In the study of Avcı (18) 74.8% of the physicians answered yes to the question "Do you recommend RV vaccination?" >10.6% of the physicians stated that they did not recommend any non-scheduled vaccines. Among the family physicians who did not recommend private vaccines to their patients, 58.7% stated that they did so because it was not included in the routine vaccination calendar of the Ministry of Health. 30.4% of the participants stated that they did not recommend the vaccine because it required payment. In the study conducted by Kolcu (25) when asked whether family physicians recommended RV vaccine to individuals, 56.5% stated that they did. In the same study, 62.6% of the participants reported that they would consider vaccinating their own children. In this study, 33.7% of the participants stated that they did not have enough time to educate families and patients about the vaccine and therefore did not recommend it. 53.1% of the participants stated that they did not have enough information to provide education about vaccination, and therefore did not recommend vaccination. 18.4% of the participants stated that they did not recommend the vaccine because the disease it targets was not severe (25). In the Yıldız (17) study, 37.2% of family physicians stated that they recommended vaccines not included in the routine vaccination schedule to the patients they followed. Among these vaccines, the RV vaccine had

the highest recommendation rate at 85.7%. In this study, 76% of physicians who did not recommend the vaccine stated that they did not recommend it because it was not included in the routine vaccination schedule, 15% because it required payment, 13.6% because they did not have enough information, and 1.7% because of its side effect profile (17).

MacDougall et al. (26) reported that 55.7% of participating physicians recommended RVs vaccine to their patients in their study conducted in Canada. O'Leary et al. (27) found that 65% of family physicians recommended the vaccine to families in their study conducted in the USA in 2013. The study investigated the necessity of routine vaccine administration and the reasons for the current attitudes of pediatricians and family physicians. In 2007, it was reported that 70% of family physicians were concerned about the RV vaccine due to safety issues, and 5% stopped recommending the vaccine altogether. Later, the FDA's statements regarding the applicability of the vaccine and the elimination of the existing risk brought the vaccine recommendations back to their previous levels (27). In the study conducted by Özkaya et al. (28) in our country, 82.8% of physicians stated that they recommended the RV vaccine to families. In this study, it was found that reasons such as increased migration-related disease burden, cost, and the idea of early immunization, affected vaccination recommendations. In addition, in this study it was found that parents most frequently refused vaccines for reasons such as ingredients, side effects, concern about autism, and religious beliefs.

In our study, 91.5% of the participants answered "yes" to the question of whether RV vaccine should be included in the routine vaccination schedule. In 2009, WHO recommended that all countries include live oral RV vaccine in routine infant vaccination programs, and more than 100 countries have introduced RV vaccines to date (29). In the Almiş et al. (30) study conducted in our country, 15 (39.5%) primary care physicians thought that the RV vaccine should be added to the routine vaccination schedule, while 10 (26.3%) thought that it was not necessary.

In a study conducted by Agyeman et al. (31) in 2009 to evaluate the attitudes of primary care physicians toward implementing RV vaccination into the swiss vaccination program, only 15% of the participating family physicians stated that they accepted routine RV vaccination. However, 48.5% of the same participant group stated that they would recommend the vaccine for their patients if the Ministry of Health authorities supported it and if it was included in the reimbursement program. The higher rate of RV vaccine recommendation and the necessity to include it in the routine vaccination schedule in our study compared to the studies in the literature may have resulted from the fact that it was conducted more recently than other studies. In our study, 91.5% of the participants thought that the RV vaccine should be included in the routine vaccination schedule, while the rate of recommending it to patients was 85.8%. The reason for

the difference may be because recommending a vaccine that has not yet been added to the national vaccination schedule is seen as a defensive medicine preference or is influenced by private vaccine fees.

In our study, the average correct response rate to questions about RV vaccines was 58.78%. Questions about RV vaccine were answered with less accuracy than questions about RV infection. In our study, 42.45% of the participants could not give correct answers to the questions about the route of administration, doses and time of administration of both types of RV vaccine. Contraindications of the vaccine, special patient groups for whom the vaccine should not be used, and the use of the vaccine with other vaccines were the questions with the least number of correct answers in our study. Adding information about RV vaccines to postgraduate education programs may increase the level of knowledge of the participants. In vaccine presentation meetings in our country, pediatricians are predominantly preferred chosen as the working group for paid vaccines such as the RV vaccine, which is not included in the national vaccination schedule.

Study Limitations

This study was conducted in a single center as a survey. With a multicenter design, it is possible to define the state of knowledge about RV infection and vaccination in family medicine education, both in other centers and nationally, in a more inclusive manner. The strength of our study is that it was conducted among family medicine residents who will actively assume immunization responsibility in primary care. In addition, opportunistic education was provided indirectly and awareness was raised by assessing infection, clinical, vaccine knowledge, and attitude at the same time is one of the strengths of our study.

CONCLUSION

RV infection is important for family physicians because it is a vaccine-preventable disease with a short vaccination period. The last dose of the vaccine can be administered up to a maximum of 24-32 weeks, and vaccination is not recommended after this period. If the necessary awareness is not created during this period, this opportunity will be missed because parents are not informed about the vaccine. In our study, the fact that the questions answered least correctly by family physicians consisted of basic points that should be known about the subject, such as the time period when the disease is frequently seen, the route of administration of the vaccine, the time of application of the vaccine, its applicability with other vaccines, and the fact that it is a live vaccine, led to the conclusion. It was concluded that a reminder and reinforcing education program should be organized at various intervals. For all vaccines, the type of vaccine, the time of application, the place of application, and possible side effects should be clearly known by family physicians, who are

most likely the primary providers of the vaccine. The most common questions answered correctly by the participants were those related to the route of transmission, clinical aspects, and treatment. These responses may indicate that the participants prioritized the therapeutic approach rather than the preventive approach to RV infection. Nevertheless, it is important to emphasize that the primary duty of family physicians is to provide protective and preventive healthcare. In our country, there are vaccines with high efficacy and safety in the current medical literature that are not included in the routine vaccination schedule. Residency associations should work to ensure that the RV vaccine, which is applied routinely in many countries, is also applied routinely in our country. Although family medicine residents had adequate knowledge about RV infection, their knowledge about RV vaccines was limited. Training can be organized to increase the level of knowledge about vaccines that are not included in the expanded immunization program. It should be emphasized that the main duty of family physicians is preventive and protective medicine.

Ethics

Ethics Committee Approval: The approval of the Clinical Research Ethics Committee of Adana City Training and Research Hospital has been obtained (decision number: 2527, date: 27.04.2023).

Informed Consent: Residents who agreed to participate and completed the consent form were included in the study.

Footnotes

Author Contributions

Surgical and Medical Practices: M.T., Concept: M.T., S.K., Design: M.T., S.K., Data Collection or Processing: M.T., Analysis or Interpretation: M.T., S.K., Literature Search: M.T., S.K., Writing: M.T., S.K.

Conflict of Interest: All authors declare that they have no conflict of interest.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. WHO, Rotavirus, Health Topics. Available from: <https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/vaccines-quality/rotavirus>.
2. Crawford SE, Ramani S, Tate JE, Parashar UD, Svensson L, Hagbom M, et al. Rotavirus infection. *Nat Rev Dis Primers*. 2017;3:17083. doi: 10.1038/nrdp.2017.83.
3. Matthijnssens J, Bilcke J, Ciarlet M, Martella V, Bányai K, Rahman M, et al. Ranst M. Rotavirus disease and vaccination: impact on genotype diversity. *Future Microbiol*. 2009;4(10):1303-16. doi: 10.2217/fmb.09.96.
4. Greenberg HB, Estes MK. Rotaviruses: from pathogenesis to vaccination. *Gastroenterology*. 2009;136(6):1939-51. doi: 10.1053/j.gastro.2009.02.076.

5. Saxena K, Blutt SE, Ettayebi K, Zeng XL, Broughman JR, Crawford SE, et al. Human intestinal enteroids: a new model to study human Rotavirus infection, host restriction, and pathophysiology. *J Virol*. 2015;90(1):43-56. doi: 10.1128/JVI.01930-15.
6. Beau I, Cotte-Laffitte J, Géniteau-Legendre M, Estes MK, Servin AL. An NSP4-dependant mechanism by which rotavirus impairs lactase enzymatic activity in brush border of human enterocyte-like Caco-2 cells. *Cell Microbiol*. 2007(9):2254-66. doi: 10.1111/j.1462-5822.2007.00956.x.
7. Miguel G O'Ryan, Morven S Edwards. Clinical manifestations and diagnosis of rotavirus infection. Available from: <https://www.uptodate.cn/contents/clinical-manifestations-and-diagnosis-of-rotavirus-infection>
8. Staat MA, Azimi PH, Berke T, Roberts N, Bernstein DI, Ward RL, et al. Clinical presentations of rotavirus infection among hospitalized children. *Pediatr Infect Dis J*. 2002;21(3):221-7. doi: 10.1097/00006454-200203000-00012.
9. Hoxha T, Xhelili L, Azemi M, Avdiu M, Ismaili-Jaha V, Efendija-Beqa U, et al. Performance of clinical signs in the diagnosis of dehydration in children with acute gastroenteritis. *Med Arch*. 2015;69(1):10-2. doi: 10.5455/medarh.2015.69.10-12.
10. Kaşifoğlu N. 2005-2011 yılları arasında saptanan rotavirus antijen pozitiflikleri. *Türk Mikrobiyol Cem Derg*. 2011;41(3):111-5. doi:10.5222/TMCD.2011.111.
11. Parashar UD, Nelson EA, Kang G. Diagnosis, management, and prevention of rotavirus gastroenteritis in children. *BMJ*. 2013;347:f7204. doi: 10.1136/bmj.f7204.
12. Troeger C, Khalil IA, Rao PC, Cao S, Blacker BF, Ahmed T, et al. Rotavirus vaccination and the global burden of rotavirus diarrhea among children younger than 5 years. *JAMA Pediatr*. 2018;172(10):958-65. doi: 10.1001/jamapediatrics.2018.1960.
13. Kaçmaz Ersü N, Ersü A, Kılıç Öztürk Y, Helvacı M, Öngel K. Characteristics of children who hospitalized by gastroenteritis and knowledge level of their parents for rotavirus vaccination. *Journal of Dr Behcet Uz Children s Hospital*. 2016;6(3): 203-08. doi: 10.5222/buchd.2016.203.
14. Dilen MF, Sucu A, Tolunay O, Celiloğlu C, Uzgeli S, Özdemir U, Çelik U, et al. Knowledge and awareness of pediatricians about rotavirus infection and vaccine. *Journal of Pediatric Infection*. 2022;2516(1):6-12. doi: 10.5578/ced.20229901
15. Soares-Weiser K, Bergman H, Henschke N, Pitan F, Cunliffe N. Vaccines for preventing rotavirus diarrhoea: vaccines in use. *Cochrane Database Syst Rev*. 2019;3(3):CD008521. doi: 10.1002/14651858.CD008521.pub4.
16. Janko MM, Joffe J, Michael D, Earl L, Rosettie KL, Sparks GW, et al. Cost-effectiveness of rotavirus vaccination in children under five years of age in 195 countries: a meta-regression analysis. *Vaccine*. 2022;40(28):3903-17. doi: 10.1016/j.vaccine.2022.05.042.
17. Yıldız C. Rize ilinde çalışan aile hekimlerinin rotavirüs enfeksiyonu ve aşıları hakkında bilgi, tutum ve davranışlarının değerlendirilmesi, *Tıpta Uzmanlık Tezi*. 2022.
18. Avcı D. Aile Hekimlerinin rotavirüs, HPV meningokok aşıları hakkında bilgi düzeyleri, tutum ve davranışları, *Tıpta Uzmanlık Tezi*. 2019.
19. Gün GT. Karaman ili hastaneleri çocuk servisinde çalışan hemşirelerin rotavirüs gastroenteriti hakkında farkındalık düzeyleri ve eğitim çalışması, *Yüksek Lisans Tezi*. [Karaman]; 2022.
20. Zafer R. Increasing awareness levels of the nurses working in children? Services of the hospitals in province of Edirne on rotavirus gastroenteritis. *İstanbul Üniversitesi, Sağlık Bilimleri Enstitüsü, Yüksek Lisans Tezi*. 2010.
21. Dinç HÖ, Taner Z, Özbey D, Gareayaghi N, Sirekbasan S, Kocazeybek BS. Prevalence of rotavirus and adenovirus childhood gastroenteritis in January 2013-December 2018 Faculty of Medicine Data. *Türk Mikrobiyol Cemiy Derg*. 2019;49(4):206-211. doi: 10.5222/TMCD.2019.206
22. Di Martino G, Mazzocca R, Camplone L, Cedrone F, Di Giovanni P, Staniscia T. Attitudes and beliefs towards Rotavirus vaccination in a sample of Italian women: a cross-sectional study. *Vaccines (Basel)*. 2023;11(6):1041. doi: 10.3390/vaccines11061041.
23. Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü. Türkiye Nüfus ve Sağlık Araştırması. Available from: https://hips.hacettepe.edu.tr/tr/2008_turkiye_nufus_ve_saglik_arastirmasi-71.
24. McPhillips HA, Davis RL, Marcuse EK, Taylor JA. The rotavirus vaccine's withdrawal and physicians' trust in vaccine safety mechanisms. *Arch Pediatr Adolesc Med*. 2001;155(9):1051-6. doi: 10.1001/archpedi.155.9.1051.
25. Kolcu H. Evaluation of knowledge, attitude and behaviour of family physicians and family medicine residents in about HPV, meningococcal and rotavirus vaccines. *Tıpta Uzmanlık Tezi*. 2019.
26. MacDougall DM, Halperin BA, Langley JM, MacKinnon-Cameron D, Li L, Halperin SA. Maritime Universal Rotavirus Vaccination Program (MURVP). Knowledge, attitudes, beliefs, and behaviors of parents and healthcare providers before and after implementation of a universal rotavirus vaccination program. *Vaccine*. 2016;34(5):687-95. doi: 10.1016/j.vaccine.2015.09.089.
27. O'Leary ST, Parashar UD, Crane LA, Allison MA, Stokley S, Beaty BL, et al. Adoption of rotavirus vaccine by U.S. physicians: progress and challenges. *Am J Prev Med*. 2013;44(1):56-62. doi: 10.1016/j.amepre.2012.10.001.
28. Özkaya Parlakay A, Yiğit M, Gülhan B, Bedir Demirdağ T, Kanık Yüksek S. Evaluation of opinions of pediatricists in a tertiary healthcare hospital about meningococcal, rotavirus, human papilloma virus vaccines and incidence of encountering vaccine refusal and reasons of vaccine refusal. *Turkish Journal of Pediatric Disease*. 2020;14(3):264-67. doi: 10.12956/tchd.726251
29. World Health Organization. Rotavirus vaccines: an update. *Weekly Epidemiological Record*. Geneva. Available from: <https://iris.who.int/handle/10665/241492>.
30. Almış H, Burcak HI. Evaluation of perspectives and approaches of primary health care physicians to the rotavirus vaccine. *Ann Med Res*. 2021;24(2):178-80.
31. Agyeman P, Desgrandchamps D, Vaudaux B, Berger C, Diana A, Heining U, et al. Interpretation of primary care physicians' attitude regarding rotavirus immunisation using diffusion of innovation theories. *Vaccine*. 2009;27(35):4771-5. doi: 10.1016/j.vaccine.2009.05.097.