



Level of Knowledge and Attitudes of Pediatricians About Meningococcal Infections and Vaccination

Pediatristlerin Meningokok Enfeksiyonları ve Aşıları ile İlgili Bilgi Düzeyleri ve Tutumları

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Abstract

Objective: Although meningococcal infections are most feared infectious diseases due to their high mortality and the possibility of leading to epidemics, there is no common practice for vaccination yet. In this study, we aimed to determine the level of knowledge about meningococcal infection and vaccination, and the attitude towards meningococcal vaccination among pediatricians.

Material and Methods: Participants were administered a 41-question survey, investigating the demographic properties, the knowledge on the meningococcal infection-vaccination and attitudes towards vaccination.

Results: The study enrolled a total of 169 participants (73 pediatrics specialists and 96 pediatric residents). Of the participants, 22.7% responded that meningococci (*Neisseria meningitidis*) was the most common cause of bacterial meningitis, while 99.1% of the participants agreed that the only reservoir in meningococcal infections was human, and 98.2% were contagious droplets. Participants stated that effective methods for protection from meningococcal infection were vaccination (81.1%), droplet isolation (66.3%), contact isolation (62.8%) and post-contact chemoprophylaxis (59.1%). While 40.7% of the participants reported that meningococcal vaccine recommended to all patients, 56.8% recommend to patients in the risk group, and 2.5% of respondents never suggested vaccination.

81.8% of the participants agreed that the meningococcal vaccine to be included in the national childhood vaccination schedule. At a rate of 86.7%, the participants had the idea that reduction of the vaccine costs would increase the vaccination frequency.

Özet

Giriş: Meningokok enfeksiyonları, yüksek mortalite ve epidemilere yol açabilmesi nedeniyle en korkulan enfeksiyon hastalıklarının başında geldiği halde henüz aşılama konusunda yaygın bir uygulama yapılmamaktadır. Bu çalışmamızda pediatri uzmanları ve uzmanlık eğitimi görmekte olan pediatri asistanlarının meningokok enfeksiyonu ve aşısı hakkındaki bilgi düzeyi ile meningokok aşısına yaklaşımlarını ölçmeyi amaçladık.

Gereç ve Yöntemler: Katılımcılara araştırmacılar tarafından hazırlanmış 41 soruluk bir anket uygulandı. Ankette katılımcıların demografik özellikleri ile ilgili sorular (n= 10), meningokok enfeksiyonu ile ilgili sorular (n= 10), meningokok aşısı ile ilgili sorular (n= 10) ve katılımcıların aşıya yaklaşımı ile ilgili sorular (n= 11) bulunmaktaydı.

Bulgular: Anket formunu doldurup çalışmaya katılmayı 169 hekim kabul etti. Katılımcıların 73 (%43.2)'ü uzman, 96 (%56.8)'si uzmanlık öğrencisi hekimdi. Bakteriyel menenjitlerin en sık etkeni sorusunu katılımcıların %22.7'si meningokok (*Neisseria meningitidis*) olarak yanıtlarken, katılımcıların %99.1'i meningokok enfeksiyonlarında tek rezervuarın insan olduğuna, %98.2'si bulaşmanın damlacık yoluyla olduğuna katılmaktaydı. Katılımcılar meningokok enfeksiyonundan korunmada etkili yöntemlerin sırasıyla aşılama (%81.1), damlacık izolasyonu (%66.3), temas izolasyonu (%62.8), temas sonrası kemoprofilaksi (%59.1) olduğunu belirtmişlerdi. Katılımcıların %40.7'si aşığı tüm hastalarına, %56.8'i risk grubundaki hastalarına önerirken, %2.5'i ise hiç önermediğini bildirdi.

Katılımcıların %81.8'i meningokok aşısının ulusal aşı şemasına girmesi gerektiğini düşünmekteydi. Katılımcıların %86.7'si konjuge meningokok

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Conclusion: Besides the somehow low level of physicians knowledge about the vaccine, prejudices such the high cost of the vaccine or low frequency of the disease and thinking the vaccine to be ineffective have also been found to be effective against meningococcal vaccination. The immunization practices may improve with the increased of the level of knowledge and awareness of pediatricians about the meningococcal vaccine.

Keywords: Knowledge, meningococcal vaccine, pediatricians

Introduction

Meningococcus (*Neisseria meningitides*) is one of the most frequent causes of meningitis and sepsis in children and adults and it is an infectious agent that may lead to Epidemics (1). Invasive meningococcal disease (IMD) is infectious disease which is rare but may cause potentially devastating consequences with high mortality and morbidity. As well as 10-15% case-mortality rate, it may cause serious sequelae such as seizures, paralysis, psychological disorders, neurological deficits, vision and hearing loss, and limb amputations in 20-40% of survivors (2). According to the studies conducted in our country, *N. meningitidis* was the second most frequent pathogen in children with bacterial meningitis between 2006 and 2009, while after 2008, it was showed that *Meningococcus* was the leading pathogen in 2008 and 2009 as a result of the inclusion of *Haemophilus influenzae* type B vaccine and conjugated pneumococcus vaccine to the national vaccine scheme (3,4). In 2014, in a multi-centric study conducted by Ceyhan and his friends, it was stated that Meningococcus was the primary cause of childhood acute bacterial meningitis with a 56.5% rate (5).

The only reservoir in meningococcal infections is human. They carried in the upper respiratory tract of approximately 10% of people and are transmitted through droplet. Meningococcal infections are usually seen below the age of 2 in developing countries, and over the age of 10 in industrialized countries (5,6). Persons between the ages of 15-24 and children below 1 year of age are the risk group for invasive meningococcal disease. Living in overcrowded environments (boarding schools, barracks, and dormitories), low socio-economic conditions, being exposed to smoke, experiencing viral respiratory infection, traveling in winter months to epidemic areas are important risk factors leading to invasive meningococcal disease (7). In addition, the risk of meningococcal disease is high in those with anatomical/functional asplenia, complement (C5-C9) deficiency (8,9).

aşı maliyetlerinin düşürülmesinin aşılama oranlarını arttıracaklarını düşünmekteydi.

Sonuç: Hekimlerin bilgi düzeylerinden bağımsız olarak maliyet düşüncesi ya da hastalığın sıklığının az olduğu bu nedenle yaygın aşılanmanın öncelikli olmadığı, aşının etkin olmadığı gibi önyargıların da meningokok aşısına karşı olmakta etkili olduğu görülmüştür. Hekimlerin yeni uygulamaya girmiş aşular ile ilgili daha iyi bilgilendirilmeleri, özellikle meningokok enfeksiyonları ve aşılamasında ön saflarda çalışan pediatristlerin meningokok aşısı konusunda bilgi düzeylerinin ve farkındalıklarının artması ile aşı uygulamaları olumlu yönde etkilenecektir.

Anahtar Kelimeler: Farkındalık, meningokok aşısı, pediatrist

Polysaccharide and conjugated vaccines are used in the prevention of meningococcal diseases but the polysaccharide vaccines are not applied to the children below two years of age because the immune response they create is weak in children. In addition, these vaccines do not reduce the carrying rate of the disease and cannot create social immunodeficiency. Nowadays, conjugated vaccines are preferred rather than polysaccharide vaccines and polysaccharide vaccination is only recommended for those who are above the age of 55 among the patients with the indication of meningococcal vaccination (7,10,11).

Conjugated vaccines include the conjugated meningococcal vaccines with single-component Serogroup C, single-component Serogroup A and 3 kinds of four-component (A/C/Y/W) due to the different conjugating proteins and the vaccines that external membrane vesicles (OMV) and external membrane proteins are used for serogroup B (4CMENB).

There are 3 different four-component conjugated vaccines in our country (6). These are the vaccine linked to diphtheria toxoid protein (Menactra®), the vaccine (Menveo®) linked to a cross-reacting material 197 (CRM197) with mutant diphtheria toxoid and the vaccine conjugated with tetanus Toxoid (Nimenrix®) (10,12,13). Meningococcal vaccine in our country is not included in the routine vaccination calendar.

Although meningococcal infections are the leading infectious diseases because they may cause high mortality and epidemics, the application of the vaccines is not widespread. In this study, we aimed to measure the approach to meningococcal vaccine and the level of knowledge about meningococcal infection and vaccination of pediatricians that are specialist or have majored in this field.

Materials and Methods

Participants joined a survey consisting of 41 questions prepared by the researchers. The questions included in the survey were about demographic characteristics of participants (n= 10), meningococcal infection (n= 10), the meningococcal vaccine (n= 10) and the participants' approach to vaccine (n=

11). The survey was prepared considering the similar studies in literature and the factors that may prevent the widespread application of meningococcal vaccine by the researchers. Participants were informed that the survey was conducted for scientific research and data that could reveal their identities were not collected. Survey forms were given to the participants to be filled by researchers and volunteers, and after the participants filled them without intervention, the survey forms were collected. In the survey; right-wrong, yes-no questions were addressed, as well as questions with multiple options for the participants to mark multiple choices.

The ethics committee approval was obtained from the "Adana Numune Training and Research Hospital non-interventional Clinical Research Ethics Board" for research.

Statistical Analysis

Statistical analysis was conducted with the program of Statistical Package for Social Sciences "version 20 (IBM Corp., Armonk, NY, USA). Descriptive statistics (number, percentage, average, and standard deviation) were calculated first of the variables in the workgroup. Then, comparative analyses were performed with Chi-square test. The significance limit is assumed to be $p < 0.05$.

Results

Demographic Findings of Participants

169 physicians agreed to fill out the survey and participate in the study. 73 of the participants (43.2%) were specialists, 96 (56.8%) were specialty students. 88 of the participants were female (52.1%), 81 were male (47.9%). The mean age of the participants was 32.24 ± 7.04 years. 107 of the participants (63.3%) were married, 62 (36.7%) were singles. 84 of the participants (49.7%) had children, while 85 (50.3%) had no child. 77 (45.6%) of the participants performed their duty at the University Hospital, 35 (20.7%), in Training and Research Hospitals, 24 (14.2%) in State Hospitals, 33 (19.5%) in private hospitals (Table 1).

Information Level of the Participants' Meningococcal Infection

The most frequent factor of bacterial meningitis was answered by 22.7% of the participants as *Meningococcus* (*N. meningitidis*), while 34.3% responded as *Pneumococcus*. 99.1% of the participants said that the single reservoir in meningococcal infections was human whereas 98.2% of the participants was through droplet. When the risk factors for meningococcal infection were asked; the splenectomy and immunodeficiency (92.8%) were first ranked, the pilgrimage/travelling to risky areas was second with the rate of 77.8%, infant age group was third with the rate of 68.3%, overcrowded was forth with the rate of 64.7%, viral upper respiratory tract infection was fifth with the rate of 28.4%, and smoking was sixth with the rate of 24%.

35.2% of the participants thought that the permanent immune could be reached with a natural meningococcal infection. When the participants are asked about the most common meningococcal strains causing to invasive meningococcal diseases (IMD); W 70.8%, A 48.2%, C 36.5%, X 36.5%, B 35.5%, Y 24.8%, and non-typeable strains were marked at 16.1%. When they were asked about the strains that cause IMD in our country; respectively, W 58%, B 33.1%, A 30%, X 27.2%, C 24.3%, Y 16.6% and non-type strains were marked at 10.1%. It was seen that whether the physicians were specialists or specialty students and that the type of hospital they were working did not make any statistically significant difference in answering these questions correctly. When the participants were asked about the effective methods to protect from meningococcal infection; the most frequently marked options, respectively; Vaccination 81.1%, droplet insulation 66.3%, contact isolation 62.8%, Chemoprophylaxis after contact 59.1%.

Meningococcal Vaccine Information Level of the Participants

While 87.6% of the participants knew that in our country there were two different types of vaccine, polysaccharide and conjugated, 12.4% thought it was a uniform vaccine. While 61.2% of the participants agreed that polysaccharide vaccines could be performed over 2 years old, 38.8% of them thought polysaccharide vaccines could be made under two years of age. When they were asked about the age limit for conjugated vaccines; they said that: respectively; ninth month marked at 37.1%, second month; 30.5%, age of one; 21.9% and age of two 10.5%. When they were asked about the strains contained in the conjugated vaccines used in our country, they marked the four-component (A/C/Y/W135) at 61.8%, single component (c) at 35.5%, single component (B) at 2.7%.

Table 1. Demographical datas of participants

	n (%)
Age (year)	32.24 ± 7.04
Gender	
Male	81 (47.9)
Female	88 (52.1)
Married	107 (63.3)
Single	62 (36.7)
Worked hospital	
Training research	35 (20.7)
University	77 (45.6)
Public hospital	24 (14.2)
Private hospital	33(19.5)
Experience	
Specialist	96 (56.8)
Specialty student	3 (43.2)

Participants’ Approach to Meningococcal Vaccine

When “Do you recommend Meningococcal vaccine to your patients?” was asked to the participants, 40.7% of physicians said that they recommended to all patients, and 56.8% of the patients in the risk group, while 2.5% of physicians did not recommend. This ratio was 45.8%, 51.4% and 2.8%, respectively in specialists, while was 36.7%, 61.1% and 2.2% respectively for the specialty students. This rate was 69.7%, 30.3%, and 0% in the private hospitals, 8.7%, 38.2% in the state hospitals, 61.8% in the training and research hospitals and, 31.9% and 65.3% in university hospitals respectively. (Table 2). The participants who did not recommend the vaccine stated the reasons such as the high cost of the vaccine, then, respectively, side effects, the idea that the incidence of the disease was low and that the vaccine was not active. When “Would you get a meningococcal vaccine for your child” was asked to the participants (if any or if they were), the option Yes was selected at the rate of 80.1% while the question “Did you get a meningococcal vaccine for your child” the Yes option was marked at the rate of 51%. While 39% of the participants said they had not get it because they thought the incidence of the disease was low, 29.9 % stated the high cost of the vaccine, 20.3% stated the side effects, 6.8% stated they thought the vaccine was inactive and 23.8% stated other reasons.

81.8% of all physicians (87.3% of the specialists and 77.7% of the specialty students) responded positively when they were asked whether they thought that meningococcal vaccine should enter the National vaccine Scheme (p= 0.111). When the

participants who thought that the vaccine should not need to enter the national vaccination scheme were asked the reasons; 56.6% cited the high cost of the vaccine, 42.3% stated that it was not primary, 15.4% mentioned about the side effects and 7.7 % stated that it was not active (Table 3).

When the participants were asked about the vaccines which should enter the national vaccine scheme as a priority, the route virus vaccine (79.3%), the conjugated meningococcal vaccine (68.9%), the HPV vaccine (44.2%) were mentioned to be included in the national vaccine scheme.

As a reason for the non-widespread use of meningococcal vaccine, 57.8% of the participants stated the high cost of vaccination, 23.1% stated th side effects, 10.9% stated that it was not effective, 14.3% stated that mothers and fathers were against it, and 52.1% stated the lacking in education.

86.7% of the participants thought the reduction of conjugated meningococcal vaccine costs would increase the vaccination rates. Expert physicians agreed to this idea at the rate of 93.1%, while specialty students agreed at the rate of 81.7% (p= 0.034). There was no significant difference in the types of hospitals worked p= 0.252).

Discussion

In this study, we aimed to measure the approach to meningococcal vaccine and the level of knowledge about meningococcal infection and vaccination of pediatricists who are one of the most effective groups in the vaccine applications.

In our study, 22.7% of the participants thought that *Meningococcus* was the most frequent factor of bacterial meningitis,

Table 2. Rate of the recommending the vaccine in terms of the hospital that are worked in

	To all patients (%)	To patients in risk group (%)	Not-recommended (%)
Education research	38.2	61.8	0
University	31.9	65.3	2.8
Public hospital	30.4	60.9	8.7
Private hospital	69.7	30.3	0

Table 3. Reasons of non-recommending the vaccine

	General (%)	The ones don’t approve to be applied to their children	For national schema
Cost	53.6	29.9	56.6
Rarity of disease	20.4	42.3	42.3
Side effects	24.3	15.4	15.4
Less effect of vaccine	9.3	6.8	7.7
Other		23.8	1.3

while 55.2% thought that *Pneumococcus* was the most frequent factor of bacterial meningitis. However, almost all participants (99.1%) agreed that in meningococcal infections, the single reservoir was human and the contamination happened through the droplet (98.2%).

When asked for risk factors for meningococcal infection; splenectomy and immunodeficiency were stated as primary reason (92.8%) and the pilgrimage/travel to risky areas was second (77.8%), as well as the other risk factors, noting that it was defined correctly over 60%. Again, vaccination was selected as the most effective method in the prevention of meningococcal infection with the rate of 81.1%.

As our study, in the literature, the comparison of the level of information about disease factors and disease could not be conducted because there were no publications on the knowledge and awareness levels of the physicians about the meningococcal diseases and its vaccines. But a recent study in our country has compared the awareness and attitudes of pediatricians and obstetrician and gynecologist on HPV infection and vaccines, and in this study, it has been seen that pediatrician specialists were not as knowledgeable as expected on HPV infection and HPV vaccine. However, their knowledge level does not have statistically significant difference with obstetrics specialists, and 59.5% of pediatricians recommends the HPV vaccine to patients (14). In our study, the level of knowledge about disease factors and disease was seen to be good.

When the *N. meningitidis* strains, which are the most frequent factors in IMD in our country, were asked, the participants said respectively; W 58%, B 33.1%, A 30%, X 27.2%, C 24.3%, Y 16%. There are 13 serogroups defined of the *N. meningitidis* causing IMD, and the incidence of these serofactions varies according to regions and countries, and also the years. In various studies conducted in our country; serogroup W, serogroup B and serogroup A were frequently seen, and after 2008, serogroup B was reported to be the leading serogroup (3-5).

In our study, 35.2 % of the participants thought that permanent immunity was available for a lifetime. When we compared the group recommending the vaccine and the other group that the participants do not recommend the vaccine because the misunderstanding that the meningococcal vaccine may lead to a permanent immunity might cause some physicians not to recommend the vaccine to their patients, there was no statistically significant difference. In terms of this result, this information is no effective in recommending the vaccine.

The health workers and especially pediatricians have an important role in the national vaccine applications and recommendations. In Spain, in a study on the attitudes of families and health workers to new vaccine applications, 82.7% of pediatricians routinely educate the parents about vaccinations recom-

mended for their children. 95% of the mothers and fathers saw the pediatrician as the most important source of information on immunization, and the parents who refrain from vaccination of their children tend to follow the advice of the doctor. It has been stated that the public awareness campaigns are needed in order to help the widespread acceptance of the changes in the vaccination programs as well as the health professionals will need strong professional advice (15).

Another study in Italy stated that serogroup B vaccine, which is a new application in their country, is largely recommended by pediatricians. In addition, it has been stated that the acceptance of this vaccine may increase with a special training program focused on increasing knowledge about prevention of meningitis and vaccination of the parents and health workers (16).

In addition, a special training program focused on increasing information about the prevention of meningitis and vaccination of parents and healthcare workers is indicated that the acceptability of this vaccine can increase (16).

In our study, the participants suggested meningococcal vaccines to their patients with a high rate of 97.5%, while 2.5% of the participants did not recommend Meningococcal vaccine, as they said that the most reason was the high cost of vaccination. The factors affecting the vaccine applications and proposals in the world and in our country are investigated in various studies, and it has been found that even in developed countries, especially in the implementation of vaccines outside the national vaccine scheme, the high cost of the vaccine is the primary reason (14,17-20). According to the evaluations on the basis of hospital studied, the pediatricians working in state hospitals do not recommend conjugated meningococcal vaccines at the rate of 8.7%, and the ones in the private hospitals all recommend it.

When we considered the patient profile consulting to the State hospital and the socio-economic characteristics of the population who preferred private hospitals and the primary concern of physicians who do not recommend vaccinations, this result seems rational.

While the participants tended to recommend vaccines in general at a high rate of 97.5% (including the patients in the risk group and others), nearly half of the participants had vaccinated their children. Although it appears to be a low rate, a study conducted in Switzerland in 2005 reported that 31.9% of pediatricians vaccinated meningococcal C to their children and that this rate was more than non-pediatricians (21). In our country, this rate was reported as 44% for HPV vaccine (14).

In our study, 81.8% of the participants suggested that conjugated meningococcal vaccine would enter the national vaccine scheme. In the survey studies conducted for the meningococcal B vaccine in France and Germany, the pedia-

trists recommended that these vaccines should be included in national schemes at high rates of 96.1%, 79%, respectively (20,21).

In the study conducted in India, in which the pneumococcus vaccine has not yet entered the routine vaccination scheme as of 2017, it was proposed that pneumococcus vaccine be included in the schema at the rate of 74% (19). In our country, this rate has been reported in the range of 60%-70% for HPV vaccine (14).

The reason proposed by the 56.6% of physicians who think that the vaccine does not need to enter the national vaccine scheme has been the higher cost of vaccination. It has also been shown in studies in various countries that the decisions taken in the national vaccine scheme for diseases that are less frequent face with difficulties, and the cost concerns are the most effective difficult in this matter (14,19,20,22-27). Also, the priority of entering national schemes in these studies conducted in our country and in the world is firstly the financial concerns and the second concern is the frequency of the illness (14,19).

In our study, 42.3% of the participants who stated that the conjugated meningococcal vaccine should not enter the national vaccine scheme, thought that it was not primary; and they thought the vaccines that should enter this scheme is respectively, the route virus vaccine (79.3%), the conjugated meningococcal vaccine (68.9%), the HPV vaccine (44.2%).

As in many studies, most of the participants (86.7%) thought that the reduction of meningococcal vaccine costs would increase the incidence of vaccination (14,19,20).

Conclusion

According to the some of the results of our study, due to physicians' low knowledge levels, as well as the cost of the vaccination or the incidence of the disease, widespread vaccination is not the primary, as the vaccine is not effective and prejudices against meningococcal vaccine are effective in this matter. The better informed of physicians and families especially regarding vaccines introduced into the new application will also positively affect vaccination rates in the target population (19,28-31).

Measures should be taken to increase the awareness and knowledge levels about meningococcal vaccination of the physicians who are the most effective factor in meningococcal infections and vaccination.

Ethics Committee Approval: Ethics committee approval was received for this study from the "Adana Numune Training and Research Hospital non-interventional Clinical Research Ethics Board" (02/10/2015. No: 194).

Informed Consent: Written informed consent was not obtained due to the retrospective nature of this study.

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