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Research Article

**KNOWLEDGE, ATTITUDE AND PRACTICES (KAP) OF
PNEUMOCOCCAL INFECTION AND VACCINATION AMONG
SUDANESE HAJJ PILGRIMS, 2016**

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Abstract

Objectives: To assess the knowledge, attitude and practice (KAP) of Pneumococcal infection and vaccination among Sudanese Hajj pilgrims.

Methods: A descriptive cross-sectional study design was followed in the study and a questionnaire was administered among the sample consisting of 614 Sudanese pilgrims. The data was analysed by SPSS, and the reliability and validity of the sample was evaluated using Cronbach Alpha.

Results: Pilgrims did not have enough knowledge regarding the vaccination and infection of pneumococcus. Moreover, age and first, second, third or more than third time Hajj were significant factors in affecting the knowledge regarding the infection, with P-value 0.043 and 0.032, respectively. On the other hand, age and residence were important factors in affecting the attitudes towards the infection with P-value, 0.032 and 0.049, respectively. Lastly, level of education was found to influence both knowledge and attitude towards the infection.

Conclusion: Healthcare workers and general practitioners should play an important role in spreading awareness regarding the infection.

Keywords: Pneumococcal, Pneumonia, Infection, Vaccination, Hajj Pilgrims, Sudanese.

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INTRODUCTION:

Pneumonia is an infection that inflames the air sacs in one or both lungs. The air sacs may fill with fluid or pus (purulent material), causing cough with phlegm, fever, chills, and difficulty in breathing. A variety of organisms, including; bacteria, viruses and fungi, can cause pneumonia ranging from mild to life-threatening illness. Pneumonia is a most serious disease for infants and young children [1], people older than 65 years of age [2], and people with health problems or weakened immune systems. Pneumococcal infections are caused by *Streptococcus pneumoniae*; a gram-positive catalase-negative organism, commonly referred to as pneumococcus. *S pneumoniae* is the most common cause of community-acquired pneumonia (CAP), bacterial meningitis, bacteraemia, and otitis media, as well as an important cause of sinusitis, septic arthritis, osteomyelitis, peritonitis, and endocarditis [3].

The Kingdom of Saudi Arabia (KSA) annually hosts more than two million Muslim pilgrims from approximately 184 countries. During Hajj pilgrimage, the presence of such large number of pilgrims from across the globe in close contact creates conditions where the potential for transmission of infectious organisms becomes high, including those related to severe diseases, such as, pneumonia. It is one of the leading causes of hospitalization of pilgrims in Saudi hospitals during Hajj. As per the records, during 1986 Hajj season, pneumonia was found to be the second most common cause of hospitalization with the highest case fatality ratio among those aged over 50 years [4].

The health-related behaviour can be influenced by various aspects of knowledge, attitude and practice (KAP). The knowledge regarding pneumonia forces people for the early uptake of the vaccines. Low-awareness of the vaccine, living arrangement, perceived low-severity of the disease, and also previous uptake of vaccination practices are some of the factors that hinders the overall health of the inflicted patients. Thus, by spreading awareness regarding the disease and vaccinations, the overall health of the patients can be maintained. The study is of utmost significance since a large number of people can be inflicted by pneumonia at one time during Hajj pilgrimage; therefore, the study will contribute to the existing literature contributing to the control measure adopted to control the spread of the disease.

AIMS AND OBJECTIVES:

The study is aimed at describing the level of knowledge, attitude and practices (KAP) about pneumococcal infection and vaccination among Sudanese Hajj pilgrims, 2016. Moreover, the study is aimed at assessing the knowledge about

pneumococcal infection and vaccination among Sudanese pilgrims. Furthermore, the study will assess the association between level of education and awareness towards pneumococcal infection and vaccination. Lastly, the study will analyse the association between background and awareness towards pneumococcal infection and vaccination.

RESEARCH QUESTIONS:

Question 1: What is the association between the level of education and awareness regarding pneumococcal infection and vaccination?

Question 2: What is the association between background and awareness regarding pneumococcal infection and vaccination?

Question 3: How is awareness regarding pneumococcal infection and vaccination important for the patients suffering from pneumonia?

LITERATURE REVIEW:

Sridhar et al⁵ conducted a study to evaluate the experience of French Hajj pilgrims with pneumococcal infection and vaccination. Thus, to evaluate the knowledge, attitude and practice regarding the following illness, questionnaires were administered to 300 participants of the study. The results of the study showed that the participants held very small knowledge regarding the severity of pneumonia and vaccines. The results suggest that the participants were not given adequate information before or during the pre-travel counselling. Moreover, only 7% of the participants were advised to uptake the vaccine before travelling.

Klett-Tammen et al [6] assessed the determinants of tetanus, pneumococcal and influenza vaccination in the elderly population. The study was aimed at evaluating the socio-economic and knowledge, attitude and practice-based determinants, which were responsible for the poor management of such illness. The results showed that the location of the residence within Germany was highly associated with the pneumococcal vaccination. Moreover, the higher the uptake of the vaccine of influenza, the lower the rate of personal health status was recorded. Furthermore, the vaccination of pneumococcal was largely knowledge-based. Thus, the knowledge, attitude and practice scores were found to be useful for gathering information regarding various KAP variables. Moreover, as evidenced from the study, the awareness of tetanus and influenza was quite common among the population; however, vaccinations of pneumococcal infections need to be increased.

Zhang et al [7] conducted a study to evaluate the vaccination knowledge, attitude and practice among Chinese travellers. The study adopted a cross-

sectional design and included 400 volunteers from each of the 14 International Travel Healthcare Centres situated in China. The demographic, stay duration, travel purpose, past travel experience, and travel destination were obtained in the following study. The results of the study showed that only 67.1% of the 2,800 Chinese travellers were aware of the travel and national vaccination recommendations. The results also predicted low knowledge regarding the diseases that were vaccine-preventable. Furthermore, the most common source of information was obtained from the requirement of the countries during the visa application procedure, and Chinese companies who have employed labourers to foreign schools or overseas for several assignments. The results show that the travellers did not possess sufficient knowledge regarding the awareness of pre-travel vaccination.

Song et al⁸ conducted a study to assess the increasing seasonal influenza vaccination among high risk groups in China. Four KAP studies were carried out on seasonal influenza vaccination in China. The study mainly targeted the guardians of the young children, adults who were aged less than or equal to 60 years and pregnant women. The results showed that the awareness was very low regarding the seasonal Influenza vaccine uptake among Chinese. Moreover, community healthcare workers were found to recommend vaccines more than the hospital healthcare workers.

Riccò et al [9] conducted a study to evaluate the knowledge, attitudes, beliefs and practices of occupational physicians towards the vaccinations of healthcare workers. 90 occupational physicians were selected for the study, out of which, 57.8% were females, 42.2% were males, and their ages were under 55 years of age. A telephonic interview was conducted and data was collected. The questionnaire included several questions regarding their knowledge of vaccination, risk-prevention associated with the diseases that are vaccine-preventable, and their natural tendency towards vaccines. The results showed that only 12 participants adequately identified the recommended vaccines. The results suggest that occupational physicians possessed little knowledge regarding the knowledge of vaccines which results in creating a vaccination gap in healthcare workers.

MATERIALS AND METHODS:

Research Design

The study has followed a descriptive cross-sectional study design. The rationale behind choosing this study design is that the data can be easily conducted and is only collected one time. The study design holds significance since it can effectively

gather information regarding all the factors under investigation. Moreover, the prevalence of a particular disease etc. can be adequately calculated for future implications.

Sample Size and Population

The study has included 614 Sudanese hajj pilgrims and the inclusion and exclusion criteria followed for the selection of pilgrims has been defined. The study was conducted during August 23rd 2016 till September 21st 2016. The inclusion criterion was based on, Sudanese pilgrims and those living in the Makah city. The pilgrims must be less than the age of 18 years. Moreover, an informed consent was also received from the study sample. The exclusion criteria of the study were, the pilgrims living outside the city of Makah, those above the age of 18 years, and pilgrims whose informed consent was not received.

Methods

A total of 614 adult Sudanese pilgrims were selected for the study and questionnaires were administered among them to ascertain their knowledge and attitudes towards pneumococcal vaccination before departing for Hajj. Their overall knowledge about the severity of pneumonia and the existence of the vaccine was evaluated. The demographic details of the sample were collected through questionnaire survey. A total of 650 questionnaires were administered to the sample, among which, only 600 were received properly filled.

Data Collection

The permission was requested from IRB to collect data from the Egyptian pilgrims. After receiving the permission, questionnaires were distributed among Sudanese Hajj pilgrims in their houses in Makah. The questionnaire included questions regarding age, gender, nationality, residence, chronic illnesses status, knowledge about pneumococcal infection, and vaccination.

Data Analysis

The data was analysed using SPSS and by creating graphical representations and describing endpoints with the help of SPSS software.

Validity and Reliability

To ensure the validity of the study, three pilot questionnaires were administered, which included five questions to analyse the perceived knowledge and attitudes towards pneumococcal vaccination before departing for Hajj. To ensure the reliability of the study, Cronbach Alpha was conducted.

Ethical Issues

Retrospective specific procedural data without patient identifier was collected. Ethical approval was obtained from institutional ethical committee of ZMZM volunteering commission ; reference number was HAPO-02-K-012-2017-03- 356.

Informed Consent

An informed consent was received from the participants of the study.

RESULTS:

Table 1 shows the demographic details of the sample selected for the study. A total of 614 adult

Sudanese pilgrims were selected for the study. Their age range was found out to be between 16-94 years with a mean Standard Deviation (SD) of 51.45 ± 12.845 . Out of these pilgrims, 85.3% were females and 14.7% were males. Moreover, 82.2% of the pilgrims were performing their first Hajj; whereas, 10.4% were performing it for second time, 2.6% of pilgrims were performing Hajj for the third time, and 4.7% were performing Hajj for more than third time. Furthermore, the years of education, residence and the chronic illness were also recorded in the following study.

Table 1: Demographic details

	N	%
Age		
<40	99	16.1
40-50	166	27.0
50-60	179	29.2
>60	170	27.7
Range	16-94	
Mean± SD	51.45 ± 12.845	
Sex of the pilgrim		
Male	524	85.3
Female	90	14.7
Hajj for		
First time	505	82.2
Second time	64	10.4
Third time	16	2.6
More than three	29	4.7
Years of education		
Range	0-30	
Mean± SD	8.20 ± 6.662	
Residence		
Big City	347	56.5
Small city	118	19.2
Village	147	23.9
Rural	2	0.3
Chronic diseases		
No	426	69.4
DM	90	14.7
HT	47	7.7
Renal failure	2	0.3
Cardio vascular disease	3	0.5
Skin disease	1	0.2
Mobility disorder	5	0.8
GIT diseases	8	1.3
Others	32	5.2

Table 2 shows the information collected from the sample regarding Pneumococcus. The signs and the

symptoms of Pneumococcus were evaluated. The results suggest that most of the pilgrims (34.5%) of

the pilgrims were not aware of the symptoms or signs of Pneumococcus; whereas, 31.6% of the pilgrims reported cough as a major symptom of Pneumococcus. Moreover, 40.6% of the pilgrims reported that the disease was mainly transferred through air when a person with this illness sneezes or coughs. Next, to the question regarding the prevention of the disease, 39.7% of the sample

reported that the disease can be prevented by covering mouth in public places when someone sneezes or coughs. Several other questions were also included in the survey, the answers obtained showed that anybody could be inflicted with the illness, the corona virus can be cured with the help of specific drugs, and only 24.4% of the pilgrims were aware of Pneumococcus.

Table 2: Pneumococcus survey

	N	%
What are the signs and symptoms of Pneumococcus?		
1-Fever and chills	86	14.0
2-Cough	194	31.6
3-Cough that lasts longer than 3 weeks	60	9.8
4-Coughing up blood	21	3.4
5-Severe headache	53	8.6
6-Nausea	28	4.6
7-Weight loss	23	3.7
8-Fever	109	17.8
9-Fever without clear cause that lasts more than 7 days	22	3.6
10-Chest pain	61	9.9
11-Shortness of breath	105	17.1
12-Ongoing fatigue	67	10.9
13-Do not know	212	34.5
How can a person get Pneumococcus?		
1. Through handshakes	61	9.9
2. Through the air when a person with Pneumococcus virus coughs or sneezes	249	40.6
3. Through sharing dishes	82	13.4
4. Through eating from the same plate	43	7.0
5. Through touching items in public places (doorknobs, handles in transportation, etc.)	65	10.6
6. Do not know	204	33.2
How can a person prevent getting Pneumococcus?		
1. Vaccination	135	22.0
2. prophylactic antibiotic	62	10.1
3. Avoid shaking hands	54	8.8
4. Covering mouth and nose when coughing or sneezing	244	39.7
5. Washing hands after touching items in public places	186	30.3
6. Closing windows at home	36	5.9
7. Through good nutrition	40	6.5
8. By praying	31	5.0
9. Do not know	174	28.3
In your opinion, who can be infected with Pneumococcus?		
1. Anybody	244	39.7
2. Only poor people	74	12.1
3. Only homeless people	22	3.6
4. Only alcoholics	10	1.6
5. Only drug users	9	1.5
6. Only people living with HIV/AIDS	31	5.0
7. Only people who have been in prison	25	4.1
8. Do not know	182	29.6
Can corona virus be cured?		
Yes	487	79.3
No	127	20.7
How can someone with Pneumococcus be cured?		
1. Herbal remedies	106	17.3

2. Home rest without medicine	26	4.2
3. Praying	9	1.5
4. Specific drugs given by health centre	343	55.9
5. DOTS	63	10.3
6. Do not know	159	25.9
Do you feel well informed about Pneumococcus virus?		
Yes	150	24.4
No	464	75.6
Who would you talk to about your illness if you had Pneumococcus?		
1. Doctor or another medical worker	536	87.3
2. Spouse	156	25.4
3. Parent	10	1.6
4. Child(ren)	20	3.3
5. Other family member	12	2.0
6. Close friend	7	1.1
7. No one	2	0.3
What would you do if you thought you had symptoms of Pneumococcus virus?		
Go to health facility	613	99.8
Go to pharmacy	1	0.2

Table 3 shows the information regarding the beliefs and the feelings of the pilgrims. The results suggest that a large number of people felt compassionate towards the people suffering from Pneumococcus virus; however, they tend to stay away from such people. Moreover, people are friendly towards such people but tend to avoid them due to the quick spread of disease from one person to another. Moreover, questions regarding corona virus

and HIV were also asked, to which the pilgrims replied that the people with HIV must be at a high risk (75.4%) of Pneumococcus virus. However, the results regarding the people with corona virus also showed that people are compassionate towards these people; however, a little resistance is being recorded among them towards people with Pneumococcus virus.

Table 3: Information regarding Pneumococcus virus

	N	%
Which statement is closest to your feeling about people with Pneumococcus virus?		
I feel compassion and desire to help	223	36.3
I feel compassion but I tend to stay away from these people	302	49.2
It is their problem and I cannot get TB	6	1.0
I fear them because they may infect me	83	13.5
In your community, how is a person who has Pneumococcus virus usually regarded/treated?		
Most people reject him or her	117	19.1
Most people are friendly, but they generally try to avoid him or her	224	36.5
The community mostly supports and helps him or her	273	44.5
Do you think that HIV positive people should be concerned about Pneumococcus virus?		
Yes	463	75.4
No	151	24.6
Why Yes?		
Person with HIV is more likely to develop corona virus	409	88.3
Do not know	54	11.7
Why not?		

Person with HIV is not more likely than	22	3.6
Do not know	592	96.4
Do you wish you could get more information about Pneumococcus virus?		
Yes	429	69.9
No	185	30.1
What would be your reaction if you were found out that you have Pneumococcus virus?		
Fear	40	6.5
Surprise	561	91.4
Embarrassment	2	0.3
Sadness or hopelessness	11	1.8
In your community, how is a person who has corona virus usually regarded/treated?		
Most people reject him or her	12	2.0
Most people are friendly, but they generally try to avoid him or her	546	88.9
The community mostly supports and helps him or her	56	9.1

Table 4 shows the sources of information on Pneumococcus. The results show that 5.9% of the information was collected through Television, 4.2% was collected through Radio, 2% from Newspapers and Magazines, 0.5% from Billboards, 0.7% from Brochures, posters or other printed materials, 2.8%

from workers, 0.7% from family and friends, 0.2% from religious leaders, and 0.8% from teachers. The amount of information disseminated from healthcare workers should have been more as compared to other sources of information for the prevention of Pneumococcus virus.

Table 4: Sources of information on Pneumococcus

	N	%
The sources of information on Pneumococcus		
1. Newspapers and magazines	12	2.0
2. Radio	26	4.2
3. TV	36	5.9
4. Billboards	3	0.5
5. Brochures, posters and other printed materials	4	0.7
6. Health workers	17	2.8
7. Family, friends, neighbours and colleagues	4	0.7
8. Religious leaders	1	0.2
9. Teachers	5	0.8

Table 5 shows that 88.8% of the sample had weak knowledge of Pneumococcus; whereas, 10.9% had average knowledge, and 0.3% had high knowledge. On the other hand, 14% of the sample showed negative attitude towards Pneumococcus virus and 86% showed positive attitude toward Pneumococcus virus.

Table 5: Knowledge and Attitude of Sample towards Pneumococcus virus

		N	%
Knowledge			
Weak		545	88.8
Average		67	10.9
High		2	0.3
Range		1-16	
Mean± SD		5.840±2.766	
Attitude			
Negative		86	14.0
Positives		528	86.0
Range		1-7	
Mean± SD		4.718±1.067	

Table 6 shows that age was found to be a significant demographic factor with P-value 0.043. Moreover, the table shows that those people who were performing their Hajj for first, second, third or more than third time were also found to have more knowledge regarding the ANOVA test regarding Knowledge of Pneumococcus virus with P-value of 0.032. A significant relation was also found between the education and knowledge of Pneumococcus virus.

Table 6: ANOVA test regarding Knowledge of Pneumococcus virus

Demographic data	N	Knowledge			F or T	ANOVA or T-test		
		Mean	±	SD		Test value	P-value	
Age	<40	99	6.242	±	2.552	F	2.739	0.043*
	40-50	166	6.175	±	2.755			
	50-60	179	5.637	±	2.770			
	>60	170	5.494	±	2.850			
Sex	Male	524	5.845	±	2.832	T	0.109	0.914
	Female	90	5.811	±	2.360			
Hajj for	First time	505	5.756	±	2.761	F	2.958	0.032*
	Second time	64	6.047	±	2.516			
	Third time	16	5.188	±	2.613			
	More than three	29	7.207	±	3.167			
Residence	Big City	347	6.014	±	2.709	F	1.998	0.113
	Small city	118	5.542	±	2.452			
	Village	147	5.714	±	3.099			
	Rural	2	2.500	±	0.707			
Correlation between Years of Education and Knowledge	r	0.341						
	P-value	<0.001*						

Table 7 showed that age and residence were found to be significant in influencing the attitudes of people towards Pneumococcus virus with P-value, 0.032 and 0.049, respectively. Moreover, a significant relation was found between education and attitude of the individuals.

Table 7: ANOVA test regarding Attitude of Pneumococcus virus

Demographic data	N	Attitude			F or T	ANOVA or T-test		
		Mean	±	SD		Test value	P-value	
Age	<40	99	4.899	±	1.045	F	2.957	0.032*
	40-50	166	4.777	±	1.047			
	50-60	179	4.743	±	1.006			
	>60	170	4.529	±	1.137			
Sex	Male	524	4.725	±	1.082	T	0.390	0.697
	Female	90	4.678	±	0.970			
Hajj for	First time	505	4.685	±	1.057	F	1.025	0.381
	Second time	64	4.828	±	1.135			
	Third time	16	4.875	±	1.258			
	More than three	29	4.966	±	0.944			
Residence	Big City	347	4.720	±	1.053	F	2.776	0.049*
	Small city	118	4.780	±	1.039			
	Village	147	4.639	±	1.104			
	Rural	2	6.500	±	0.707			
Correlation between Years of Education and Attitude	r	0.210						
	P-value	<0.001*						

DISCUSSION:

The study was aimed at assessing the knowledge, attitude and practice (KAP) of Pneumococcal infection and vaccination among Sudanese Hajj pilgrims. The study adopted a descriptive cross-sectional study design and included 614 Sudanese pilgrims. The data was collected with the help of questionnaire from the participants and the collected data was analysed with SPSS. The results of the study showed that a small number of people were aware of the prevention of Pneumococcus virus through vaccines. Moreover, the results showed that age and Hajj for first, second, third or more than third times played a significant role in the knowledge regarding Pneumococcus virus and age and residence played a significant role in the attitude regarding the Pneumococcus virus. Moreover, education was found to be significant with both knowledge and attitude.

The findings of the study were found to be consistent with the results obtained by Dumyati et al¹⁰. The study was aimed to discuss the knowledge, attitude and practices about Pneumococcal infection among Algerian Hajj pilgrims. A total of 964 Algerians was selected for the study and a structured questionnaire was distributed among the participants. The results of the study showed that education was an important factor in the prevention of infection. Thus, the study suggested that Pneumonia was found to be the main source of illness during Hajj and occurs among considerable pilgrims.

Schneeberg et al [11] conducted a study to evaluate the knowledge, attitudes, beliefs, and behaviours of older adults about pneumococcal

immunization. The results of the study showed that 58% of the patients received pneumococcal vaccine among 863 participants, which were consistent with the findings of the current study. Thus, the results suggested that the vaccine uptake was significantly influenced by the healthcare recommendation in the elderly participants. To this end, the healthcare providers must be encouraged to participate in disseminating information regarding the uptake of vaccine.

The results conducted by Sridhar et al [5] were found consistent with the results of the current study. The results showed that the knowledge of pneumonia was quite low among the participants who participated in the study. Moreover, only a small number of people were advised by their practitioner to uptake vaccination of pneumonia. Thus, the results suggested that healthcare workers are required to disseminate information to the people who are planning to take vacation or travel for Hajj or Umrah. Moreover, the practitioners at the travel clinic can play a crucial part in spreading awareness regarding Pneumococcal infection and vaccination.

Another study conducted by How et al [12] concluded results that were consistent with the findings of the study. The study evaluated the parental knowledge, attitude and perception of pneumococcal disease and its conjugate vaccine in the region of Singapore. The study followed the same pattern as the current study for the collection of data. The results showed that cost of the vaccination was a factor that significantly affect the uptake of pneumococcal vaccination among population.

Moreover, there was a lack of knowledge among parents regarding the PCV vaccination that further affect the PCV uptake in the region of Singapore.

Valletta et al [13] conducted a study to evaluate pneumococcal pneumonia among older adults. The key aim of the study was to increase the rate of vaccination uptake among the older adults aged 65 years or older. The results of the study showed that by increasing the information regarding the vaccination of the following disease the rate of vaccination uptake can be increased. The results showed that the knowledge related to the vaccination was vulnerable among the population group and thus, primary care setting must play their part of the role to increase patient education regarding pneumococcal pneumonia vaccination.

Pre-travel vaccinations are considered to be an effective technique that may result in the reduction of the risk of various diseases. Moreover, Streptococcus pneumonia during Hajj has been previously studied and evaluated to provide recommendations regarding vaccinations to the high-risk groups. The disease can be easily transferred to other people due to which adequate measures are required from both peoples and healthcare workers end to limit the spread of Pneumococcal infection. To this end, the study was aimed at discussing the knowledge, attitude and practices of Pneumococcal infection among Sudanese Hajj pilgrims. The results of the study suggested that the pilgrims were not very much aware of the vaccination and infection of pneumonia. Thus, healthcare workers must disseminate information from their end to the pilgrims before any vaccination to control the spread of the infection.

LIMITATIONS:

- The study has included only the Sudanese pilgrims; therefore, future studies are advised to consider maximum groups of Hajj pilgrims.
- The study has included only a small number of pilgrims and thus, to develop more robust results, future studies must include a large sample size.
- Other vocational trips, other than Hajj, must also be evaluated as there is a small amount of literature present on such topics.

RECOMMENDATIONS:

- Healthcare workers need to disseminate useful information regarding pneumonia and its vaccination to the pilgrims.
- Necessary measures must be taken to provide a proper guideline for the prevention of the disease.

- Pilgrims should cover their faces during Hajj where necessary.
- Pilgrims must make the practice of washing hands frequent during Hajj.
- The uptake of vaccination must be made necessary before taking any vacation.
- The study was mainly based on developing results regarding Pneumococcal infection, several other infections must also be included.
- The future studies must include the severity of these diseases if not properly treated on time with vaccination or drug dose.

REFERENCES:

1. Maoxia LI, Wan C, A retrospective analysis of clinical features and death factors of infants and young children with severe pneumonia, Chinese Pediatric Emergency Medicine, 2015:113-8.
2. Suzuki M, Dhoubhadel BG, Ishifuji T, Yasunami M, Yaegashi M, Asoh N, et al, Serotype-specific effectiveness of 23-valent pneumococcal polysaccharide vaccine against pneumococcal pneumonia in adults aged 65 years or older: a multicentre, prospective, test-negative design study, The Lancet infectious diseases, 2017;17:313-21. Doi: 10.1016/s1473-3099(17)30049-x
3. Ramamoorthy K, Sundaram AS, Detection of Chlamydia pneumonia and Mycoplasma pneumonia in hospitalised children with community acquired pneumonia, International Journal of Contemporary Pediatrics. 2018. Doi: 10.18203/2349-3291.ijcp20182076
4. Memish ZA, Assiri A, Almasri M, Alhakeem RF, Turkestani A, Al Rabeeah AA, et al, Impact of the Hajj on pneumococcal transmission, Clinical Microbiology and Infection, 2015;21:77-e11. Doi: 10.1016/j.cmi.2014.07.005
5. Sridhar S, Belhouchat K, Drali T, Benkouiten S, Parola P, Brouqui P, et al, French Hajj pilgrims' experience with pneumococcal infection and vaccination: a knowledge, attitudes and practice (KAP) evaluation, Travel medicine and infectious disease, 2015;13:251-5. Doi: 10.1016/j.tmaid.2015.02.002
6. Klett-Tammen CJ, Krause G, Seefeld L, Ott JJ, Determinants of tetanus, pneumococcal and influenza vaccination in the elderly: a representative cross-sectional study on knowledge, attitude and practice (KAP), BMC public health, 2015;16:121. Doi: 10.1186/s12889-016-2784-8
7. Zhang M, Zhang J, Hao Y, Fan Z, Li L, Li Y, et al, Vaccination knowledge, attitude and practice among Chinese travelers who visit travel clinics in Preparation for international travel, Journal of

- travel medicine, 2016;23, taw051. Doi: 10.1093/jtm/taw051
8. Song Y, Zhang T, Chen L, Yi B, Hao X, Zhou S, et al, Increasing seasonal influenza vaccination among high risk groups in China: Do community healthcare workers have a role to play? *Vaccine*, 2017;35:4060-3. Doi: 10.1016/j.vaccine.2017.06.054
 9. Riccò M, Cattani S, Casagrande F, Gualerzi G, Signorelli C, Knowledge, attitudes, beliefs and practices of occupational physicians towards vaccinations of health care workers: A cross sectional pilot study in North-Eastern Italy, *International journal of occupational medicine and environmental health*, 2017;30:775. Doi: 10.13075/ijomeh.1896.00895
 10. Dumyati MS, Bakr Balubaid SA, Althobaiti FA, Azizurrehman HA, Sindi BZ, Knowledge, Attitude and Practices about Pneumococcal Infection among Algerian Hajj Pilgrims, *Egyptian Journal of Hospital Medicine*, 2018;70. Doi: 10.12816/0043987
 11. Schneeberg A, Bettinger JA, McNeil S, Ward BJ, Dionne M, Cooper C, et al, Knowledge, attitudes, beliefs and behaviours of older adults about pneumococcal immunization, a Public Health Agency of Canada/Canadian Institutes of Health Research Influenza Research Network (PCIRN) investigation, *BMC Public Health*, 2014;14:442. Doi: 10.1186/1471-2458-14-442
 12. How CH, Chun PP, Shafi F, Jakes RW, Parental knowledge, attitudes and perception of pneumococcal disease and pneumococcal conjugate vaccines in Singapore: a questionnaire-based assessment. *BMC public health*, 2016;16:923. Doi: 10.1186/s12889-016-3597-5
 13. Valletta JE, *Pneumococcal Pneumonia in the Older Adult: Increasing Patient Education and Vaccination*. 2016.