Immunizations during Hajj is it effective: Coverage and Barrie

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Abstract— Prolonged stays at hajj sites; crowdedness, extreme heat, and physical exhaustion accommodation encourage disease transmission. A part of Hajj rituals also is the animal slaughter, which can increase the risk of exposure to zoonotic diseases. Head shaving for men is another Hajj ritual increasing a health risk to blood borne infections including HIV, hepatitis B and hepatitis C. Immunization is a great success of preventive medicine. The Ministry of Health, Saudi Arabia issues annual recommendations including vaccination requirements for incoming visitors to reduce the risk of communicable disease transmission during the Hajj. This study is a cross-sectional study, using a questionnaire to assess the level of coverage, barriers and the factors affecting the decision to take vaccines, the study was a part of a campaign carried out for 7 days from 4 Sept – 11 Sep 2017 targeted the Holy places in Al Madinah Al Munawarrah. The results showed that 51.4% of the participants were males, 80% of them do not suffer from chronic disease, 86.6% are non-smokers and 44.4% do not exercise, 93.2% heard about vaccines and vaccines preventable disease. 80.4% of pilgrims recommend taking the seasonal influenza vaccine, 96.7% of them took vaccine for Hajj that year, and the most important vaccinations taken by pilgrims that year were fever and influenzas. 38.4 % of the participants reported that, the most important factors that motivated them for taking the vaccines was the advice from the health care community and national guidelines, on the other hand lack of time was the most important barrier prevented pilgrims from taking the vaccines.

Index terms--- Hajj, Saudi Arabia, infectious diseases, RTIs, health risks.

1 INTRODUCTION

Hajj is the fifth pillar of the five pillars of Islam. Every adult and healthy Muslim is obliged to do Hajj if he/she is financially and physically capable once in his/her life. Hajj is the biggest annual gathering of its kind in the world which bringing millions of people in a small and geographically confined area [1] densities of Crowd in hajj are about up to seven people per square meter [2] whereas each year, over 2 million Muslims perform pilgrimage, gathering from all over the world in Saudi Arabia [3] Health risks due to the extreme congestion of people at the Hajj are a critical issue [3].

Prolonged stays at hajj sites, crowded, extreme heat and physical exhaustion accommodation encourage disease transmission, especially the disease which deriving from airborne agents [2] As well overcrowding, physical exertion and any existing medical conditions such as; cardiovascular illness and diabetes mellitus are increase the chance of acquiring infectious diseases among pilgrims [4] For elderly people are more prone to infectious disease because of the impairment of the immune system and the disruption of both of diets and sleep. With regard to the spread of infectious diseases among pilgrims according to nationality, it was found that most cases were traced to Indonesian pilgrims (18%), Saudis (17%) and Pakistani (11%) pilgrims [4] Recently, respiratory tract infections (RTIs), including tuberculosis and influenza , have been the major health risks at the Hajj [5].

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Also during animal slaughter, as part of Hajj rituals increase the risk of exposure to zoonotic diseases. Head shaving for men is another Hajj ritual increasing a health risk. performing Head shaving is with blades or razors which if used without changing for several hajjis able to transmit blood borne infections including; HIV, hepatitis B and hepatitis C [1].

During Hajj the increasing in the incidence of infection has a serious impact on the population general health because it could lead to an epidemic infection and it have impact on the economic by increasing costs of healthcare and demands of hospital beds in addition to participating to the loss of workdays [4] often with far reaching ramifications, most notably global outbreaks of meningococcal and cholera disease [5].

The strong and right knowledge about the health problems that's faced by the pilgrims the factors concerning to these problems is important for effective management of health services [6] Immunization is a great success of preventive medicine [7] But In European countries and America, national gaps in decrease coverage among minorities and immigrants are suggestive of neglected inequalities in provision of health care quality and access often overlapping with national socioeconomic stratifications [3]

The Ministry of Health, Saudi Arabia issues annual recommendations including vaccination requirements for incoming visitors to reduce the risk of communicable disease transmission during the Hajj [5] For all pilgrims, the vaccination against meningococcal serogroups A, C, W135 and Y is a strict requirement to the entry visa [5] Poliomyelitis vaccination is compulsory for certain affected countries with this disease, it should be done for all ages and regardless of vaccination status, proofed by certificate of oral or inactivated polio vaccine, it should be 4 weeks or more before departure and during the past 12 months [8] Also Yellow fever, some countries within

endemic yellow fever should present certificate of vaccination against the disease, which starts 10 days after vaccination period [8] Additionally, t is recommended that pilgrims are up to date with routine vaccinations against tetanus, pertussis, mumps, measles, polio and diphtheria, and get the seasonal vaccine for influenza (especially People who at high-risk of severe influenza) before travel to the Hajj [5].

The main objective of this study is to assess level of immunization coverage and its associated factors among Hajj pilgrims, Al Madinah Al Munawarah, during 1437/1438 season.

.2 OBJECTIVES OF THE STUDY:

2.1 General objective is:

To assess the coverage rate of immunization among pilgrims.

2.2 Specific objetives:

- ✓ To assess the prevalence of immunization coverage among Hajj pilgrims
- ✓ To study the association between level of knowledge and compliance of vaccination
- ✓ To investigate the barriers that face Hajj pilgrims to take the vaccines and their suggestions to overcome them.

.3 METHODOLOGY:

3.1 Study design:

This study will be carried out as a cross-sectional study design, using a questionnaire to assess the level of level of covrage , barriers and the factors affecting the decision to take vaccines, Hajj pilgrimage 1437/1438 in Al-Madinah Al-Monawarah region, Kingdom of Saudi.

3.2 Settings:

This study will be a part of a campaign, which will be carried out for 7 days from 4 Sept – 11 Sep 2017 targeted the Holy places where Hajj pilgrimage suspected to be there in Al Madinah Al Munawarrah.

3.3 Traget population:

The target population will include all people who are coming for Hajj this year, both gender, 18 years and older, who will be available in the places and duration of the event, if they agree to participate.

3.4 Exclusion criteria:

Non-Hajj pilgrims, children younger than 18 years old, who will refuse to participate, speaking non-available language.

3.5 Sampling:

All pilgrims who attended these events will be invited to participate in our study. Convenient sampling of all those who agreed to participate will be included.

3.6 Data Collection:

Standardized Questionnaire is available in Arabic and will be modified and translated to other five languages. In addition, both electronic and paper version of questionnaires will be available.

The items in the questionnaire will be obtained from numbers of validated questionnaires and validity will be completed by reviewing it by 3 experts.

Before the start of the study, the semi-structured questionnaires will be pre-tested on 35 of the subjects to explore if there is any ambiguity or items leading to misunderstanding in the questionnaire in order to reach to its current final form. These 35 subjects will not be included in the main survey.

The questionnaire will be re-administered after a week to the same sample of the pilot study to check test-retest reliability

3.7 Data entry and Statitical analysis:

Statistical Analysis will be used. Data will be coded, entered, and analyzed using the Statistical Package for Social Science (SPSS) version 20.0 (SPSS, Chicago, IL, USA).

3.8 Ethical clreancnce:

Official permissions will be obtained from the scientific ethical committee of the collage. Informed consent will be obtained from all the participants after describing the aim of the study. Privacy and confidentiality will be assured.

.4 DATA STATISTICAL ANALYSIS:

This section of the study gives descriptive analysis through the repeat tables and the diagrams for the participant's answers on all the questionnaire questions, and then it analyzes and clarifies the most important statistical analysis obtained to achieve the study objectives.

4.1 Population & Sample of the Study:

The study population includes all people who are coming for Hajj this year , both gender, 18 years and older , who was available in the places and duration of the event, a random sample size (1293) pilgrims was selected, the following table shows their characteristics according to their personal data.

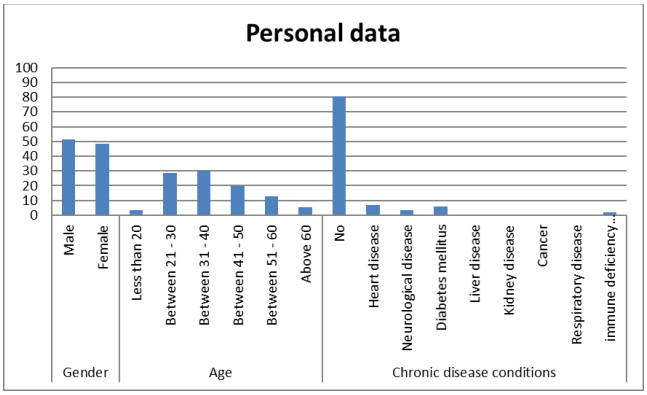
TABLE 1: THE PARTICIPANTS PERSONAL DATA (N=1293).

Personal Data		#	%	P-value
Gender	Male	664	51.4	0.330
	Female	629	48.6	
Age	Less than 20	45	3.5	0.00**
	Between 21 - 30	368	28.5	
	Between 31 - 40	392	30.3	
	Between 41 - 50	257	19.9	
	Between 51 - 60	165	12.8	
	Above 60	66	5.1	
Chronic disease conditions	No	1041	80.5	0.00**
	Heart disease	86	6.7	
	Neurological disease	46	3.6	
	Diabetes mellitus	76	5.9	
	Liver disease	3	.2	
	Kidney disease	4	.3	
	Cancer	8	.6	
	Respiratory disease	6	.5	
	immune deficiency disease	23	1.8	

Chi-squared test: **Significant at 0.01

It is clear from the previous table that 51.4% of the participants were males, while 48.6% of them were females, and their distribution according to their ages 30.3% of them were between (31- 40) years old, 28.5% of them were between (21-30) years old, 19.9% of them were between (41-50) years old, 12.8% of them were between (51-60) years old,5.1% of them were more than (60) years old, while 3.5% of them were less than (20) years old.

In addition, their distribution according to chronic diseases, 80% do not suffer from chronic disease, while 6.7% suffer from heart disease, 3.6% suffer from neurological diseases, 5.9% suffer from diabetes mellitus, 0.2% suffers from liver disease, 0.3% suffers from kidney disease, 0.6% suffers from cancer, 0.5% suffers from respiratory disease, and 1.8% suffers from immune deficiency disease.



The next figure concludes the previous results:

Figure (1): The participant's personal data.

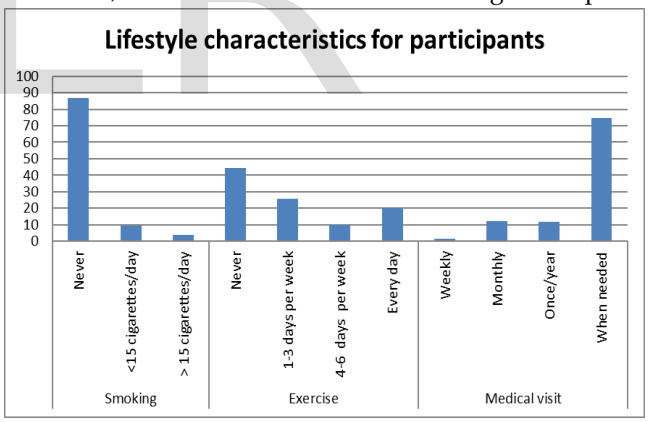
The following table shows the Lifestyle characteristics for participants

TABLE (2): LIFESTYLE CHARACTERISTICS FOR PARTICIPANTS (N=1293).

Personal Data		#	%	P-value
Smoking	Never	1120	86.6	0.00**
	<15 cigarettes/day	123	9.5	
	> 15 cigarettes/day	50	3.9	
Exercise	Never	574	44.4	0.00**
	1-3 days per week	334	25.8	
	4-6 days per week	126	9.7	
	Every day	259	20.0	
Medical visit	Weekly	21	1.6	0.00**
	Monthly	156	12.1	
	Once/year	151	11.7	
	When needed	965	74.6	

Chi-squared test **Significant at 0.01

It is clear from the previous table that 86.6% of pilgrims are not smokers, while 9.5% smoke less than 15 cigarettes per day, and 3.9% smoke more than 15 cigarettes per day.



In terms of exercise, 44.4% do not exercise, 25.8% exercise 1-3 days per week, 15% exercise 4-6 days per week.

As for visiting a doctor, the majority of participants visit the doctor when needed.

The next figure concludes the previous results:

Figure (2): Lifestyle characteristics for participants.

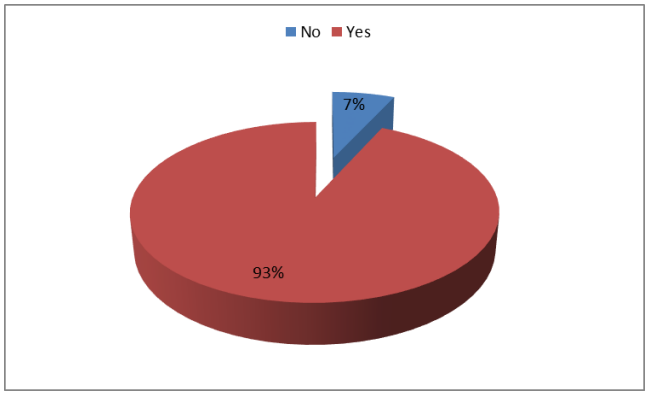
4.2 Analysis of results

The next table shows the participants' distribution according to their hearing about vaccines and vaccines preventable disease.Where 93.2% heard about vaccines and vaccines preventable disease, while 6.8 did not heard about vaccines and

vaccines preventable disease.

TABLE (3): SHOWS THE PARTICIPANTS' DISTRIBUTION ACCORDING TO THEIR HEARING ABOUT VACCINES AND VACCINES PREVENTABLE DISEASE.

	Frequency	Percent
No	88	6.8



Yes	1205	93.2
Total	1293	100.0

Figure (3): shows the participants' distribution according to their hearing about vaccines and vaccines preventable disease.

The following table shows the respondents' views on the health requirements for travellers to Saudi Arabia for Pilgrimage to Makkah (2016) (mandatory vaccines).

Where 80.4% of pilgrims believe the importance of taking yellow fever vaccine, while 48% believe the importance of taking Meningococcal vaccine, and 9.1% believe the importance of taken poliomyelitis vaccine

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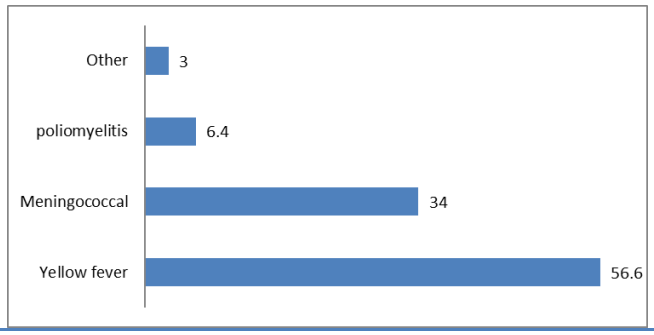
TABLE (4): SHOWS THE DISTRIBUTION OF RESPONDENTS' VIEWS ON THE HEALTH REQUIREMENTS FOR TRAVELLERS TO SAUDI ARABIA FOR PILGRIMAGE

	Frequency	*Percent*
Yellow fever	969	56.6
Meningococcal	582	34.0



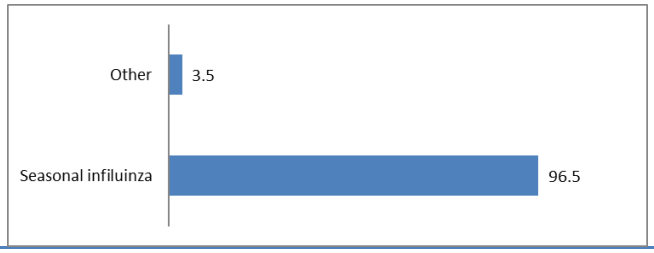
poliomyelitis	110	6.4
Other	52	3.0

Figure (4): shows the distribution of respondents' views on the health requirements for travellers to Saudi Arabia for Pilgrimage

The following table shows the respondents' views for the health recommendations for travellers to Saudi Arabia for Pilgrimage to Makkah (2016) (recommended vaccines), Where 80.4% of pilgrims recommend taking the seasonal influenza vaccine.

TABLE (5): SHOWS THE RESPONDENTS' VIEWS FOR THE HEALTH RECOMMENDATIONS FOR TRAVELLERS TO SAUDI ARABIA FOR PILGRIMAGE

	Frequency	*Percent*



Seasonal infiluinza	860	96.5
Other	31	3.5

Figure (5): shows the respondents' views for the health recommendations for travellers to Saudi Arabia for Pilgrimage

The following table shows the respondents' views on the vaccines preventable diseases:

TABLE (6): SHOWS THE RESPONDENTS' VIEWS ON THE VACCINES PREVENTABLE DISEASES.

	Frequency	*Percent*
Measles	866	10.8
Whooping cough	624	7.8
Hepatitis A	641	8.0
Hepatitis B	595	7.4
Hepatitis C	545	6.8
Malaria	589	7.3
Tuberculosis	827	10.3
Typhoid	491	6.1
Diphtheria	471	5.9
Meningitis	737	9.2
Fever	946	11.8
Pain	537	6.7
rash	86	1.1
Diarrhea	53	0.7
cramps	42	0.5

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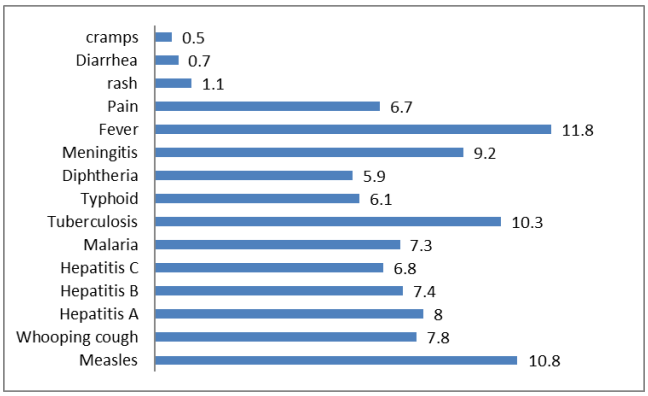


Figure (6): shows the respondents' views on the vaccines preventable diseases.

The next table shows the participants' distribution according to taking vaccine for Hajj this year, where it is clear that 96.7% of them took vaccine for Hajj this year, while 8% do not took vaccine for Hajj this year.

TABLE (7): SHOWS THE PARTICIPANTS' DISTRIBUTION ACCORDING TO TAKING VACCINE FOR HAJJ THIS YEAR

	Frequency	*Percent*
No	43	3.3
Yes	1250	96.7
Total	1293	100.0

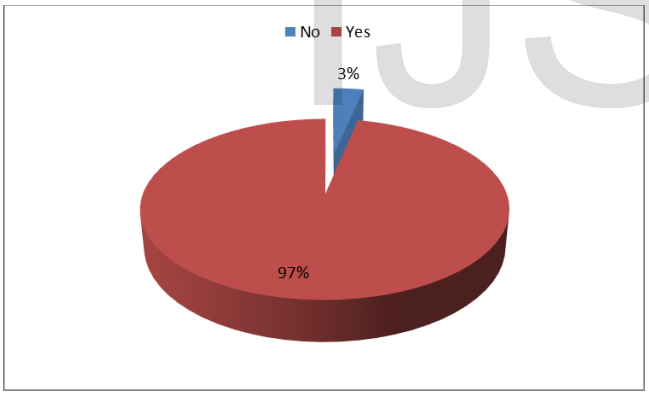
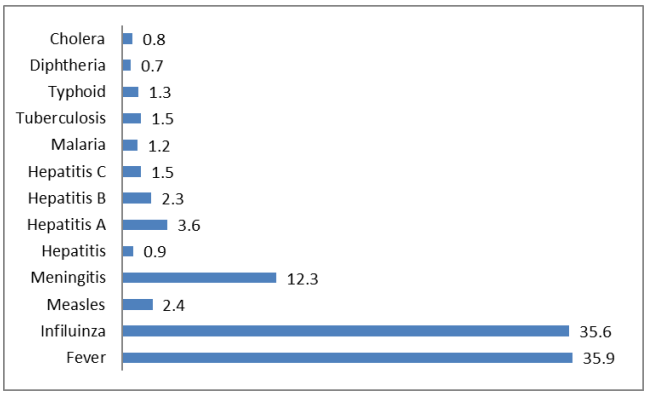


Figure (7): Shows the participants' distribution according to taking vaccine for Hajj this year

The following table shows the most important vaccinations taken by pilgrims this year:

TABLE (8): SHOWS THE MOST IMPORTANT VACCINATIONS TAKEN BY PILGRIMS THIS YEAR

	Frequency	*Percent*
Fever	897	35.9
Infiluinza	890	35.6
Measles	61	2.4
Meningitis	306	12.3
Hepatitis	22	0.9
Hepatitis A	89	3.6
Hepatitis B	57	2.3
Hepatitis C	38	1.5
Malaria	30	1.2
Tuberculosis	37	1.5
Typhoid	32	1.3
Diphtheria	18	0.7
Cholera	21	0.8



The following figure shows that:

Figure (8): shows the most important vaccinations taken by pilgrims this year

The following table shows the most important factors that motivated the pilgrims for taking the vaccines.

TABLE (9): SHOWS THE MOST IMPORTANT FACTORS THAT MOTIVATED THE PILGRIMS FOR TAKING THE VACCINES.

N=1250	*Frequency*	*Percent*
advice from the health care community , national guidelines (for example , Saudi health regulations for Pilgrimage to Makkah)	692	38.4
advice from friends , family , colleagues	191	10.6
self protection	300	16.7
to protect others	84	4.7
belief in benefits of the vaccine	346	19.2
perceived severity of illness	97	5.4
Because it is free	14	0.8
Because of my age	13	0.7
religious reasons (obligation to save life)	33	1.8
advertising campaign & Media attention (social media)	30	1.7

The following figure shows that:

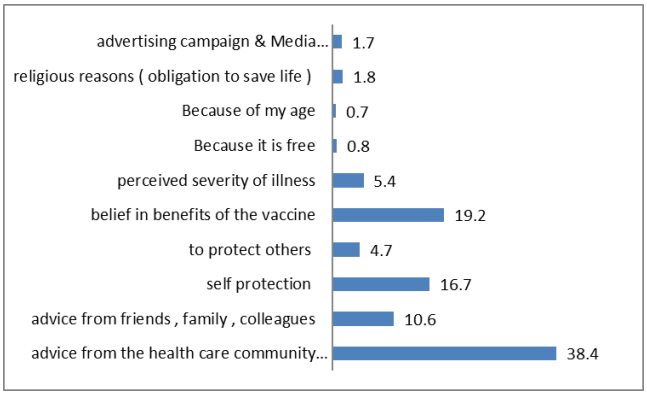
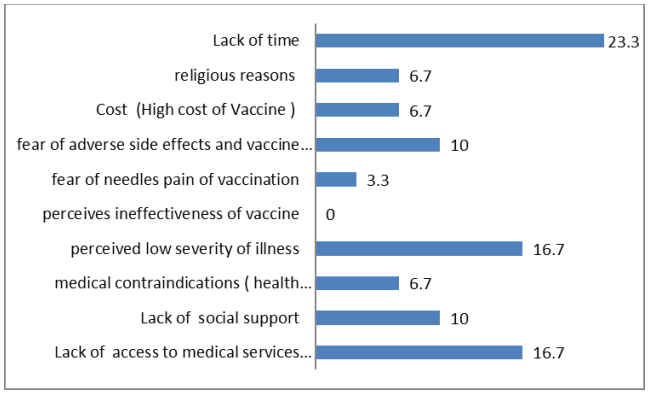


Figure (9): shows the most important factors that motivated the pilgrims for taking the vaccines.

The following table shows the most important barriers that prevented pilgrims from taking these vaccines.

TABLE (10): SHOWS THE MOST IMPORTANT BARRIERS THAT PREVENTED PILGRIMS FROM TAKING THESE VACCINES.

N=43	*Frequency*	*Percent*
Lack of access to medical services (inconvenience)	5	16.7
Lack of social support	3	10.0
medical contraindications (health problems)	2	6.7
perceived low severity of illness	5	16.7
perceives ineffectiveness of vaccine	0	0.0
fear of needles pain of vaccination	1	3.3
fear of adverse side effects and vaccine safety	3	10.0
Cost (High cost of Vaccine)	2	6.7
religious reasons	2	6.7
Lack of time	7	23.3



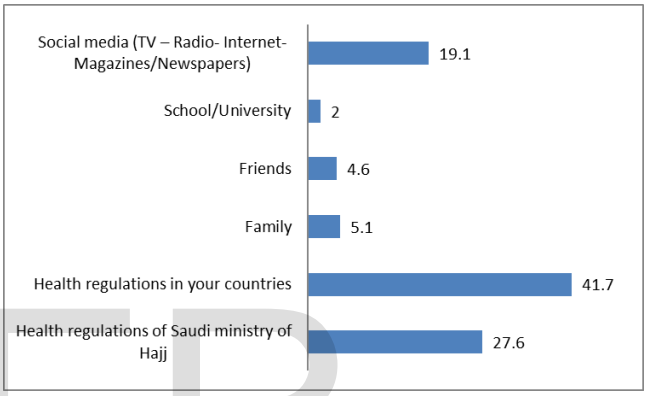
The following figure shows that:

Figure (10): shows the most important barriers that prevented pilgrims from taking these vaccines.

The following table shows the most important sources in which pilgrims heard about vaccines.

TABLE (11): SHOWS THE MOST IMPORTANT SOURCES IN WHICH PILGRIMS HEARD ABOUT VACCINES.

	Frequency	*Percent*
Health regulations of Saudi ministry of Hajj	467	27.6
Health regulations in your countries	706	41.7
Family	86	5.1
Friends	78	4.6
School/University	34	2.0
Social media (TV – Radio- Internet- Magazines/Newspapers)	324	19.1



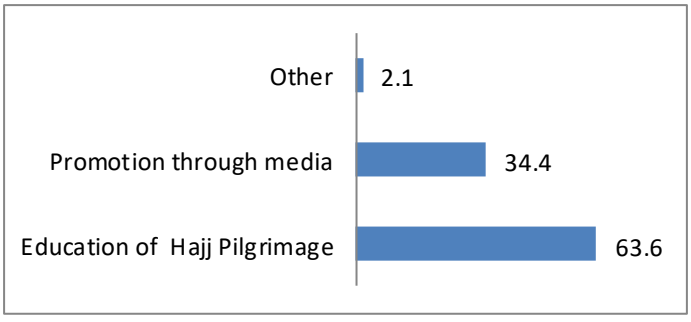
The following figure shows that:

Figure (11): shows the most important sources in which pilgrims heard about vaccines.

The following table shows the pilgrims' suggestions to increase compliance of vaccinations among Hajj pilgrimage.

TABLE (12): SHOWS THE PILGRIMS' SUGGESTIONS TO INCREASE COMPLIANCE OF VACCINATIONS AMONG HAJJ PILGRIMAGE.

	Frequency	*Percent*
Education of Hajj Pilgrimage	709	63.6
Promotion through media	383	34.4
Other	23	2.1



The following figure shows that:

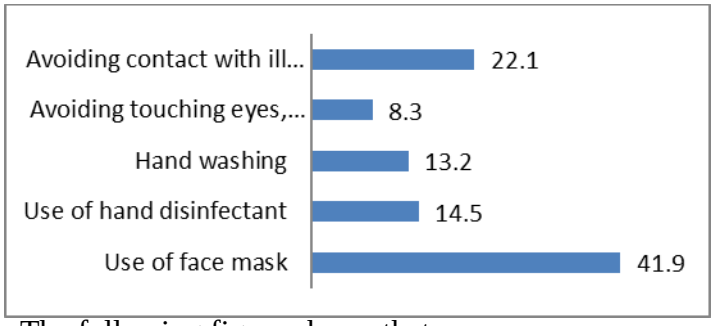
Figure (12): shows the pilgrims' suggestions to increase compliance of vaccinations among Hajj pilgrimage.

The following table shows the pilgrims' suggestions for al-

ternative mechanism to prevent Hajj Pilgrimage from VPD (vaccine preventable disease) other than vaccine.

TABLE (13): SHOWS THE PILGRIMS' SUGGESTIONS FOR ALTERNATIVE MECHANISM TO PREVENT HAJJ PILGRIMAGE FROM VPD.

	Frequency	*Percent*
Use of face mask	797	41.9
Use of hand disinfectant	276	14.5
Hand washing	251	13.2
Avoiding touching eyes, nose and mouth	157	8.3
Avoiding contact with ill people	421	22.1



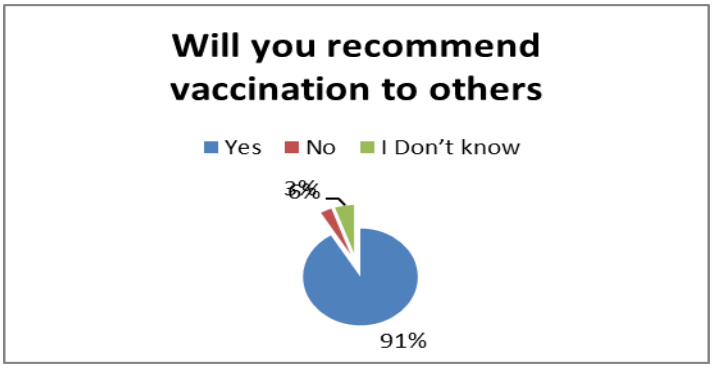
The following figure shows that:

Figure (13): shows the pilgrims' suggestions for alternative mechanism to prevent Hajj Pilgrimage from VPD.

The next table shows the participants' distribution according to whether will recommend vaccination to others, where we note that 91.3% of them will recommend vaccination to others, while 3.2% of them will not recommend vaccination to others.

TABLE (14): SHOWS THE PARTICIPANTS' DISTRIBUTION ACCORDING TO WHETHER WILL RECOMMEND VACCINATION TO OTHERS.

	Frequency	*Percent*
Yes	1181	91.3
No	42	3.2
I Don't know	70	5.4
Total	1293	100.0



The following figure shows that:

Figure (14): shows the participants' distribution according to whether will recommend vaccination to others.

The relationship Test

TABLE (15): SHOWS THE RELATIONSHIP BETWEEN ASSOCIATION BET KNOWLEDGE AND COMPLIANCE ON VACCINATION.

		Did you take vaccine for Hajj this year?		*Chi-Square test*	*P-value*
		Yes	No		
Have you ever heard about vaccines and vaccines preventable disease	Yes	1130	30	42.470	.000*
	No	66	13		

Chi-squared test: *Significant at 0.05

We conclude from the above table that: There is a relationship between association bet knowledge and compliance on vaccination.

.5 DISCUSSION:

Vaccination against infectious diseases before Haijj is a very important health issue as it affects more than 2 million people yearly. We surveyed 1293 pilgrims to assess the prevalence of immunization coverage, knowledge about vaccination, barriers against vaccination and ways to improve the vaccination coverage. According to the respondents, the vaccination coverage was 96.7% for our study group and only 93.2 heard about vaccines and vaccines preventable diseases. 71.2% of the pilgrims said that they took influenza vaccine, while only 24.5% said that they took the meningococcal vaccine reflecting either low coverage of meningococcal vaccine or low knowledge of them about the vaccines they took. Not all other vaccines exceeded 7.1%.

The knowledge about the mandatory and recommended vaccines showed much variation, it was as high as 80.4 for yellow fever, low as 9.1% for poliomyelitis and was 48% for Meningococcal meningitis. 80.4% of the respondents said that the ministry of health recommends taking influenza vaccine.

They also showed variable responses regarding their knowledge about the vaccines preventable diseases , 71.9% selected measles , 68.6% selected tuberculosis , 61.2 selected meningitis , while other diseases were very low as diphtheria which was chosen by 39.1% of them.

The most common side effect of vaccination according to their choices was fever 78.5%, followed by pain 44.6%, while other side effects were chosen rarely (3.5-7%).

Analysis of the motivation factors showed that the most important motivator was the advice by the healthcare community representing 55.4% of cases followed by other factors as believing in the benefits of the vaccination and for self-protection. The health regulation of hajj in other country was the main source of information about vaccination representing 54.6% of cases followed by the Health regulations of Saudi

ministry of Hajj representing 36.1% of cases. The barriers against vaccination included various factors, including lack of time, inability to access medical services, suffering from illness or for fear of the side effects.

The main pilgrims' suggestions to increase compliance of vaccinations among Hajj pilgrimage were through educating the pilgrims and through media.

Comparing the prevalence of vaccination in our study conducted in the Hajj 2016 to previous studies shows much improvement in the coverage. In a study named" Influenza vaccine in Hajj pilgrims: Policy issues from field studies" performed on pilgrims from UK during 2005 and 2006 and published 2008, of total 555 pilgrims who underwent virological surveillance 148 (27%) received influenza vaccine and 390 (70%) did not. [9]

In other study performed on healthcare workers from Saudi Arabia, attending the Hajj during 2003 and named "Meningococcal, influenza virus, and hepatitis B virus vaccination coverage level among health care workers in Hajj" and published 2007, A 392 HCWs were studied including 215 (54.8%) nurses and 177 (45.2%) doctors. Only 23 (5.9%) HCWs received the current year's influenza virus vaccine. 323 (82.4%) HCWs received the quadrivalent (ACYW135) meningococcal meningitis vaccine, 260 (66.3%) of HCWs received the three-dose hepatitis B vaccine series [10].

In other study named "Determinants of tetanus, diphtheria and poliomyelitis vaccinations among Hajj pilgrims, Marseille, France", performed on pilgrims from France in 2003, and surveyed 580 participant. Total vaccination rates for tetanus (18.9%), diphtheria (14.7%) and poliomyelitis (15.0%) [11].

The role of health education before Hajj and the role of media is apparent in the results of a study by A S Alqahtani et al,[i] who studied the awareness of Australian Hajj pilgrims' knowledge, attitude and perception about Ebola, November 2014 to February 2015 and found that Pilgrims who received pre-travel health advice were more conscious of Ebola (69% vs 31%, $p = 0.01$) and adhered better to hand hygiene after touching an ill person (68% vs 31%, $p < 0.01$). Mass media was the main information source (78%) [3].

A systematic review of observational studies of Hajj pilgrims done by A. S. Alqahtani et al[ii] demonstrated the high variability in the reported uptake of vaccinations against respiratory infections and although influenza vaccine coverage appears to be increasing, the uptake of other vaccines is sub-optimally low. Moreover, there are no data on the uptake or effectiveness of other vaccines such as measles/mumps/rubella used in travel clinics in this population. The influenza vaccine was found to be protective against laboratory-confirmed influenza in this population. The study also showed that among vaccines against respiratory infections, influenza vaccine is the most studied in Hajj pilgrims. The uptake of influenza vaccine is improving year on year from a level of 0.7% in 2002 to 100% in 2009and then showing slight decline but still maintaining an acceptable coverage of around 75% in some study countries, including Australia and Iran. [5].

We can conclude from our study that although the coverage of Hajj vaccination is high and improving over years, there is still defective knowledge about the needed vaccinations and their role in preventing diseases. We recommend the focusing on health education and media messages to the pilgrims, especially through the different healthcare providers, and to incorporate the vaccination process for the mandatory and recommended vaccines in the process of application with continuous monitoring of the prevalence of vaccination coverage in the coming years.

ACKNOWLEDGMENT

The authors wish to thank Taibah Medical Club TMC for all their efforts, funding this survey & providing us the chance to participate in their campaign. In addition, we are grateful to all data collectors who participated with us distributing this survey

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