The Egyptian Journal of Hospital Medicine (January 2018) Vol. 70 (5), Page 806-817

Knowledge, Attitude and Practices About Pneumococcal Infection among Algerian Hajj Pilgrims

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ABSTRACT

Background: Hajj attendance increases the risk of respiratory infections including pneumonia. Pneumococcal infections are caused by Streptococcus pneumonia, a gram-positive, catalase-negative organism normally mentioned as pneumococcus. S pneumonia is the most mutual reason of community acquired pneumonia (CAP), bacteremia, otitis media, and bacterial meningitis, in addition to a significant cause of sinusitis, osteomyelitis, septic arthritis, endocarditis, and peritonitis. Complications of each of these diagnoses are common. Clinical symptoms, signs and physical examination findings alone cannot differentiate S pneumonia disease from infections caused by other pathogens.

Methods: This was a cross-sectional study among Algerian in al Hajj Pilgrimage. A sample size of 964 Algerian was collected. Data collection took place in September 2016. A structured questionnaire was developed to cover the research objectives. The questionnaire was originally developed in English and then translated into Arabic; its validity was reviewed by selected health care experts and professionals and tested on a sample of the target population. Selected candidates were interviewed by trained medical students; a brief description of the study. If they agreed to participate, the student administered the questionnaire verbally. Almost 10 minutes were needed to complete the questionnaire. The process continued till the required sample size was completed.

Results: All data showed that education is correlated to prevent infection and help them to deal with patient infected with pneumococcus.

Conclusion: Before Hajj doctors must teach and inform all the participants about how to deal with any infectious disease, particularly pneumonia.

Keywords: Pneumococcal infections, Algerian, Hajj, S pneumonia.

INTRODUCTION

Pneumonia is a common cause of bacterial meningitis, bacteremia, and otitis media. S pneumonia infection is also an important cause of sinusitis, septic arthritis, osteomyelitis, peritonitis, and endocarditis[1]. S pneumonia remains the most common bacterial cause of community-acquired pneumonia (CAP).

However, a recent study involving state-of-the-art diagnostic techniques for bacterial, viral, and fungal infections indicated that a specific pathogen was detected in only 38% of CAP cases. Of these cases, one or more viruses were retrieved in 23% of cases and bacteria in 11%.

A combination of bacterial and viral pathogens was seen in 3%. Fungal and mycobacterial organisms accounted for 1%. Human rhinoviruses were isolated in 9% of cases and influenza virus in 6%. S pneumonia remained the most common cause of bacterial CAP, at 5% of patients [2].

Pneumococcal pneumonia frequently develops in older children and adults. Occasionally preceded by a viral disease, there was acute start of high fever, malaise, rigors, tachycardia, pleuritic chest pain, dyspnea, tachypnea, productive cough, and fatigue. Patients normally appeared ill and might seem anxious.

On physical examination, rales may be heard in most patients.

Around half of all patients' exhibited dullness to percussion, and splinting because of pain could be seen. The most mutual complication of pneumococcal pneumonia was pleural effusion. In patients with concomitant parapneumonic effusion or empyema, physical examination might exposed the dullness to percussion, reduced breath sounds, and reduced tactile fremitus at the bases. Though up to 40% of patients with pneumococcal pneumonia might have pleural effusion, only an expected 10% of these patients have enough fluid to aspirate; of these, only 2% met the diagnostic criteria for empyema [3, 4].

Hajj is one of the biggest yearly gatherings on the planet and draws in more than 2 million

Received: 1/12/2017 DOI: 10.12816/0043987
Accepted: 11/12/2017

pilgrims from practically every nation. The Hajj happens between the eighth and thirteenth day of the last month of the Islamic calendar (355 days), and subsequently, falls at various dates each year. The gathering of such a significant number of individuals from various parts of the world in overcrowded and confined regions for a short period of time presents numerous public health challenges.

The combination of physical efforts, overpopulation and any pre-existing health conditions improves the likelihood of gaining irresistible maladies amid the Hajj journey [5].

Mass gatherings can be classified into two sorts: unconstrained gatherings and arranged gatherings. Arranged gatherings are repetitive at various areas (e.g. World Cup football tournament and Olympic Games) or repetitive occasions at a similar area (e.g. the Hajj pilgrimage in Saudi Arabia) [6].

Those health risks, especially infectious diseases, can influence people to infectious ailments for example, meningococcal meningitis and respiratory tract infections[7]. Furthermore, outbursts of infectious diseases, mainly diarrheal diseases, acute respiratory tract infections, and meningococcal meningitis, have regularly been reported among Hajjis [8].

Given that the normal Hajj journey ranges between 30 to 45 days, the majority of pilgrims will most probably be in danger for getting an ailment. This pilgrimage contains of a stay of around 6 days in Jeddah city, which is the passage point to Saudi Arabia in readiness for the prepared events, followed by around 10 days of special prayers in Madinah city. From that point forward, approximately 8 days are spent in Makkah performing critical tasks, and, at last, the rest of the period is spent planning to come back to the beginning area [9].

Al-Ghamdi et al recognized respiratory illness as the most well-known reason (57%) of admission to hospital with pneumonia being the main explanation behind affirmation, influencing 39% of all patients [10].

A comparable finding was acquired by Madani et al who found that disease with pneumonia was the most widely recognized reason for hospitalization (19.7%) amid Hajj [11].

METHODS

Study setting & design

This is a cross-sectional study among Algerian in al Hajj Pilgrimage.

Variables

The dependent variable in this study was the knowledge of pneumococcal infection. The predisposing variables were age, gender, education, residency, and history of using any preventive measures, how pneumococcal infection can be cured, how to deal with a patient infected with pneumococcal, and the source of information.

Socio-demographic variables

- ✓ The age of the participants at the time of the interview was recorded in number.
- ✓ An education was recorded as the number of years.
- ✓ Gender was defined as (male) and (female).
- ✓ The residency was defined as (big city), (small city), (village), (rural area).
- ✓ Knowledge about pneumococcal symptoms was defined as: (Fever), (chills), (headache), (nausea), (coughing), (coughing blood), (weight loss), (chest pain), (difficulty breathing), (fatigue), and (do not know); scored from 0-10 0-3 poor knowledge
  - 4-6 good knowledge
  - More than 6 excellent knowledge
  - Do not know; scored 0
- ✓ Treatment of pneumococcal infection was defined as: (herbal remedies), (using of pain killer with vitamin c), (home rest), (good nutrition), (proper medication after counselling health provider).
- ✓ How to deal with patient infected with pneumococcus was defined as: (free contact), (isolated), (I do not know).
- ✓ The Source of information was defined as (health provider), (friends or family), (Social medias), (Flyers, posters, or Magazine), (TV or radio).
- ✓ Knowledge: Knowledge was defined according to the participant's response to a questions: "how pneumococcal infection can be treated, how to deal with patient infected with pneumococcus", The identification right answer (proper medication after counselling health provider, free contact respectively) alongside with:
  - Health provider as source of information 'excellent knowledge'
  - (friends or family) (Social medias), (Flyers, posters, or Magazine), (TV or radio) as source of information 'good knowledge'.
  - If any or both questions answered incorrectly, it will be considered as 'poor knowledge'.

- ***Sampling design***

A multistage sampling process was used. Administratively, Algerian candidates were chosen to conduct the study.

- **Sample size**

A sample size of 964 Algerian was collected.

- **Data collection**

Data collection took place in September 2016. A structured questionnaire was developed to cover the research objectives.

The questionnaire was originally developed in English and then translated into Arabic; its validity was reviewed by selected health care experts and professionals and tested on a sample of the target population.

Selected candidates were interviewed by trained medical students; a brief description of the study. If they agreed to participate, the student administered the questionnaire verbally.

Almost 10 minutes were needed to complete the questionnaire. The process continued till the required sample size was completed.

The study was done after approval of ethical board of Zamzam Association of Voluntary Health Services Organization.

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Data analysis

Statistical Methods

Quantitative data were statistically represented in terms minimum, maximum, mean, standard division (SD) and median. Comparison between different groups in the presents study was done using Mann-Whitney Test for comparing two nonparametric groups, and using Kruskal-Wallis Test was used when the comparison between more than two nonparametric groups.

Qualitative data were statistically represented in terms number and percent. Comparison between different groups in the presents study was done using Chi-Square Test.

A probability value (p value) less than or equal to (0.05) was considered significant. All statistical analysis was performed using statistical software SPSS (Statistical Package for Social Science) statistical program version (16.0). Graphs were done using Microsoft Excel program version 2010. Statistical significance was set at $P<0.05$.

RESULTS

Table 1: shows the age and education state

	N	Mean± SD	Min	Max	Median
Age	964	54.17 ± 13.28	20	99	54
Education	964	10.06 ± 5.95	0	25	12

As shown in table 1, most of Algerian participant in this study were old and poor educated.

Table 2: shows the awareness of hajij for pneumococcal infection and treatment

Parameters	Groups	No.	Percent	Chi-Square	P value
Gender	Male	842	87.30%	537.759	0.001
	Female	122	12.70%		
Residency	Big City	659	68.40%	1060.556	0.001
	Small City	215	22.30%		
	Village	86	8.90%		
	Rural Area	4	0.40%		
Herbal Remedies	Yes	72	7.50%	697.510	0.001
	No	892	92.50%		
Home Rest	Yes	54	5.60%	760.100	0.001
	No	910	94.40%		
Fever	Yes	304	31.50%	131.469	0.001
	No	660	68.50%		
Chills	Yes	196	20.30%	339.402	0.001
	No	768	79.70%		
Headache	Yes	51	5.30%	770.793	0.001
	No	913	94.70%		
Nausea	Yes	59	6.10%	742.444	0.001
	No	905	93.90%		
Cough	Yes	409	42.40%	22.112	0.001
	No	555	57.60%		
Coughing Blood	Yes	45	4.70%	792.402	0.001
	No	919	95.30%		
Weight Loss	Yes	32	3.30%	840.249	0.001
	No	932	96.70%		
Chest Pain	Yes	96	10.00%	618.241	0.001
	No	868	90.00%		
Difficult Breathing	Yes	169	17.50%	406.510	0.001
	No	795	82.50%		
Fatigue	Yes	78	8.10%	677.245	0.001
	No	886	91.90%		
Not Know	Yes	416	43.20%	18.075	0.001
	No	548	56.80%		
Good Nutrition	Yes	38	3.90%	817.992	0.001
	No	926	96.10%		
Using of pain killer with vitamin C	Yes	233	24.20%	257.266	0.001
	No	731	75.80%		
Proper medication after counseling health provider	Yes	649	67.30%	115.722	0.001
	No	315	32.70%		
How to deal with patient infected with pneumococcus	Isolation	163	16.90%	252.438	0.001
	I do not know	253	26.20%		
	Free Contact	548	56.80%		
Health Provider	Yes	270	28.00%	186.490	0.001
	No	694	72.00%		
Family & Friends	Yes	221	22.90%	282.660	0.001
	No	743	77.10%		
TV & Radio	Yes	390	40.50%	35.120	0.001
	No	574	59.50%		
Flyers, Posters, or Magazine	Yes	82	8.50%	663.900	0.001
	No	882	91.50%		
Social Medias	Yes	1	0.10%	960.004	0.001
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As shown in table 2, most of the participants in this study were male (78.3%,p≤.001), from big city (68.40%, p≤.001),few of them used herbal Remedies (7.50% p≤.001,), few of them knew that they would have some rest (5.60%,p≤.001),few of them had been informed that pneumonia is associated with fever (31.50%, p≤.001),or Chills (20.30%, p≤.001),or Headache (5.30%, p≤.001),or Nausea (6.10%, p≤.001).But they understand better that pneumonia is associated with Cough (42.40%, p≤.001) but few knew about the Coughing Blood and pneumonia (4.70%, p≤.001) or Weight Loss (3.30%, p≤.001) or Chest Pain (10.00%, p≤.001) or Difficult Breathing (17.50%, p≤.001) or Fatigue(8.10%, p≤.001) and most of the participant did not know anything about pneumonia (56.80% , p≤.001). Very few of the participants learned about Good Nutrition (3.90%, p≤.001) but they understand better to use pain killer with vitamin C (24.20%, p≤.001).But most of them could use Proper medication after counseling health provider (67.30%, p≤.001).

About How to deal with a patient infected with pneumococcus few understood about isolation (16.90%). Others did not (26.20%), yet on the other side, most of them believed in free contact (56.80%, p≤.001). Only 28.00% (p≤.001) believed in Health Provider. Others (22.90%%, p≤.001) take their knowledge from Family & Friends, others (40.50%, p≤.001) from TV & Radio. Only 8.50% (p≤.001) take their knowledge from flyers, Posters, or Magazine. Only 0.10% (p≤.001) knows about medical knowledge from Social Media.

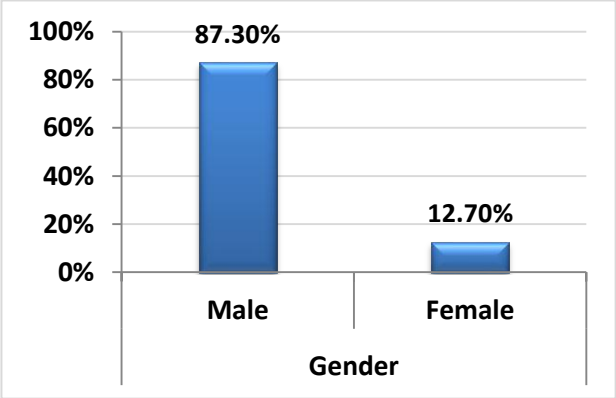

Fig. 1: shows the % of male to female

Fig.. 1: showed that male were more than female where recorded 87.30% and 12.70% respectively

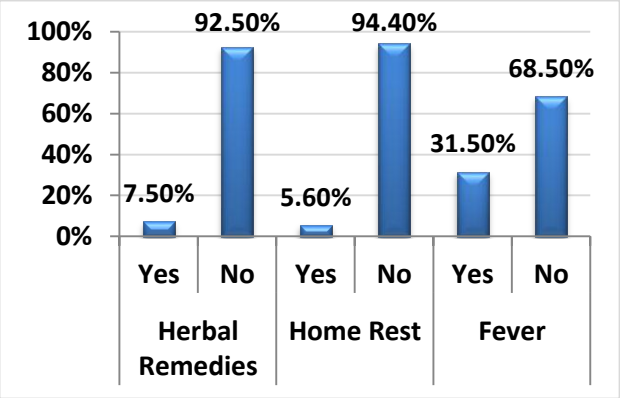

Fig. 3: demonstrates the knowledge of participant about correlation of pneumonia with herbal medicine, home rest and fever

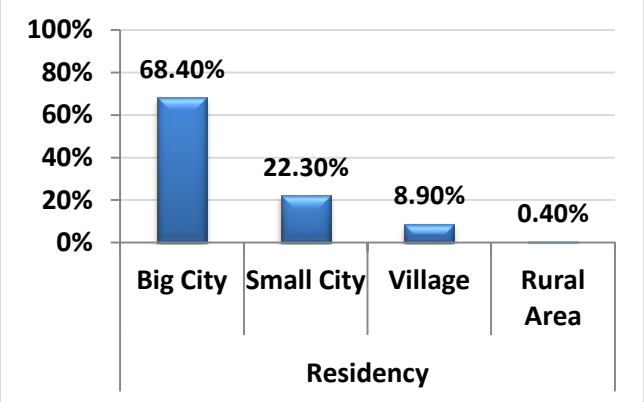

Fig. 2: reveals the Residency of Algerian in al hajj

As shown in Fig..2, most of Algerian participant in this study were from big cities.

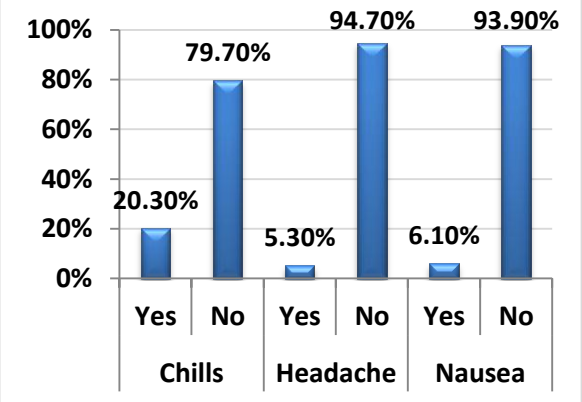

Fig. 4: presents the knowledge of participant about correlation of pneumonia with chills, headache and nausea.

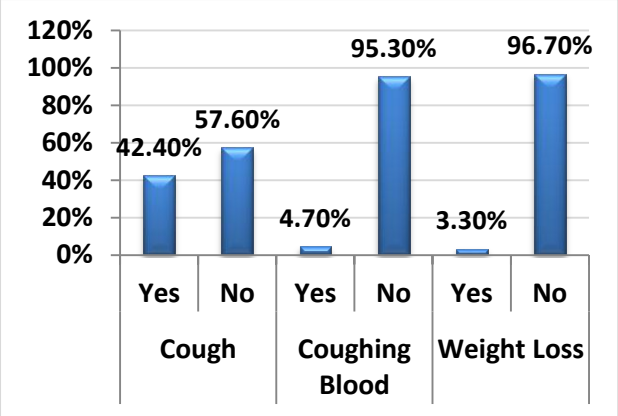

Fig. 5: shows the knowledge of participant about correlation of pneumonia with cough, coughing blood and weight loss

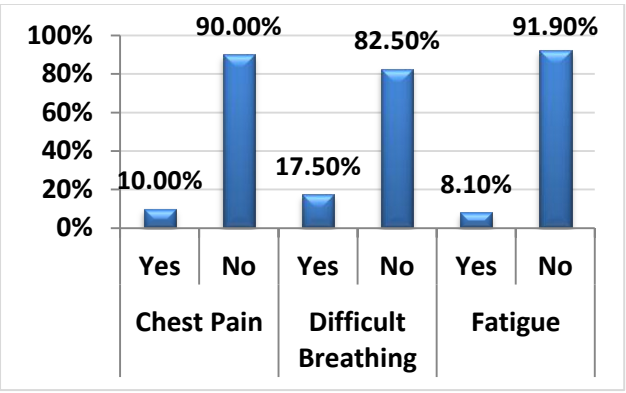

Fig. 6: points the knowledge of participant about correlation of pneumonia with chest pain, difficult breathing and fatigue

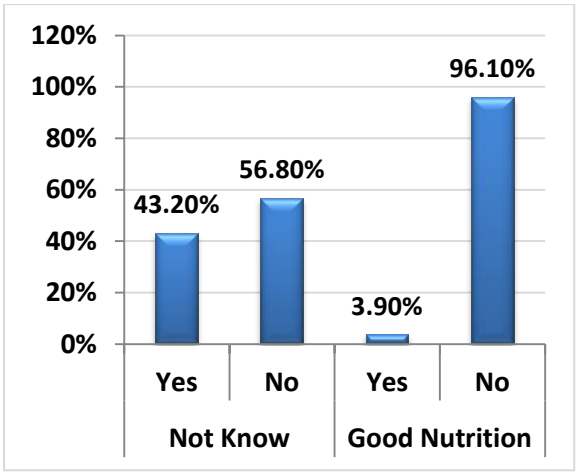

Fig. 7: shows the knowledge of participant about correlation of pneumonia with Good nutrition and their knowledge about pneumonia

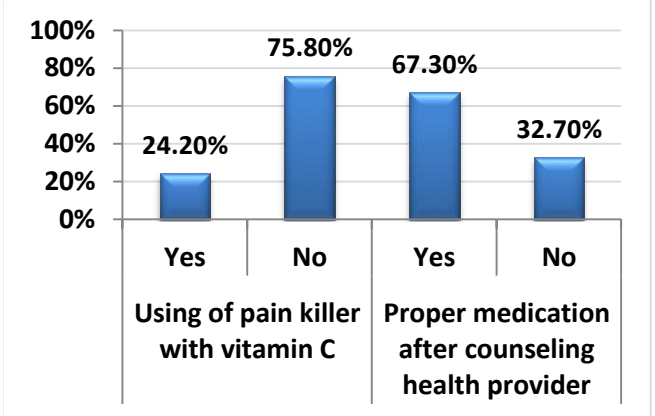

Fig. 8: displays the knowledge of participant about correlation of pneumonia with using of pain killer with vitamin C or proper medication after counseling health provider

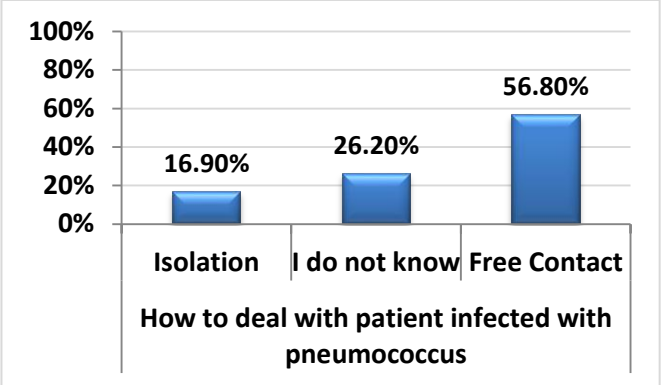

Fig. 9: shows the knowledge of participant about correlation of pneumonia with isolation,

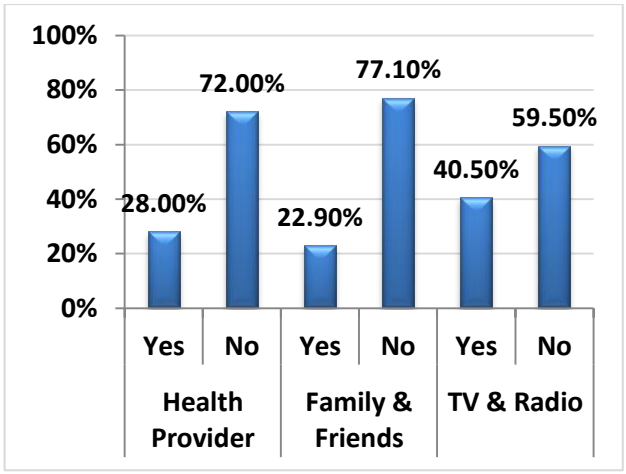

Fig. 10: shows the source of knowledge of participant from health provider or family and friends or TV and radio.

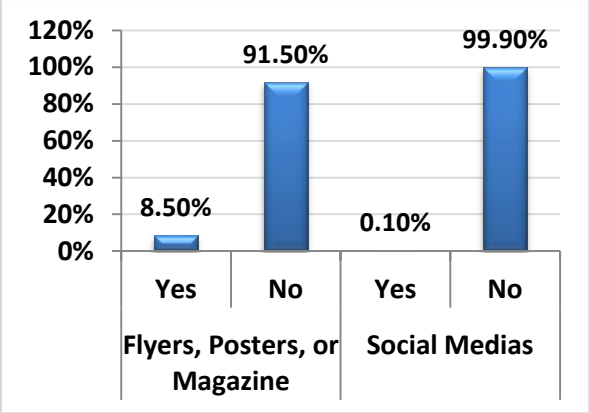

Fig. 11: shows the source of knowledge of participant from flyers, posters, magazine or social media.

Table (3): Correlation between Age and Education

Parameters	R (Spearman Correlation Coefficient)	P value	Correlation Direction
Age with Education	-0.354**	0.001	Negative Correlation

** Correlation is significant at the 0.01 level.

It is clear from table 3 that there is a significant correlation between age and education.

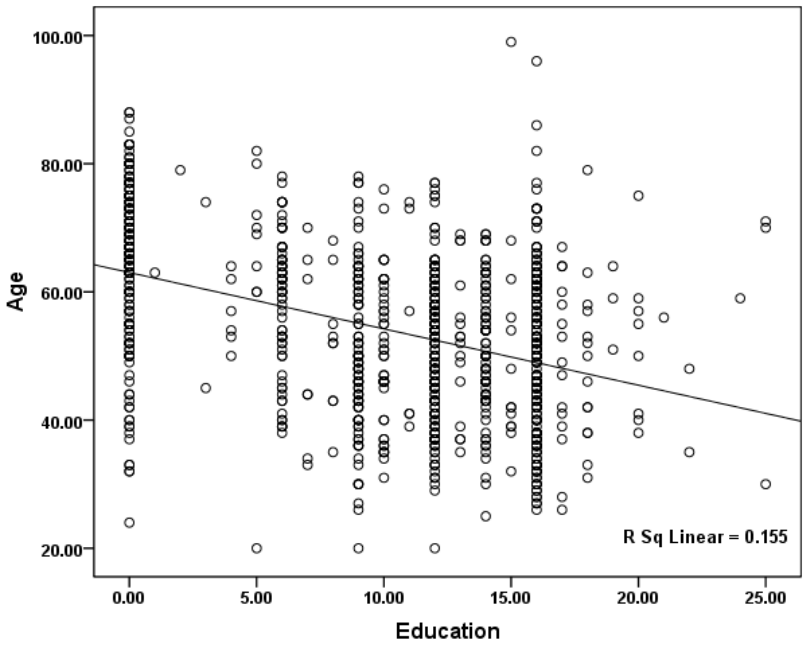

Fig. 12: Correlation between Age and Education with best fit line curve (negative correlation).

Table (4): The Effect of all Parameters on Education

Parameters	Groups	N	Mean ± S.D.	Min.	Max.	Median	P value
Gender	Male	842	10.26 ± 5.80	0	25	12	0.040
	Female	122	8.67 ± 6.75	0	25	10	
Residency	Big City	659	10.70 ± 5.74	0	25	12	0.001
	Small City	215	9.88 ± 5.75	0	22	12	
	Village	86	5.86 ± 6.24	0	20	5.5	
	Rural Area	4	4.50 ± 5.74	0	12	3	
Herbal Remedies	Yes	72	11.22 ± 5.42	0	25	12	0.148
	No	892	9.97 ± 5.98	0	25	12	
Home Rest	Yes	54	10.93 ± 6.15	0	25	12	0.353
	No	910	10.01 ± 5.94	0	25	12	
Fever	Yes	304	11.53 ± 5.39	0	25	12	0.001
	No	660	9.39 ± 6.07	0	25	12	
Chills	Yes	196	11.22 ± 5.92	0	25	12	0.001
	No	768	9.77 ± 5.92	0	25	12	
Headache	Yes	51	10.35 ± 6.18	0	25	12	0.916
	No	913	10.05 ± 5.94	0	25	12	
Nausea	Yes	59	10.93 ± 6.05	0	25	12	0.357
	No	905	10.01 ± 5.94	0	25	12	
Cough	Yes	409	10.74 ± 5.76	0	25	12	0.004
	No	555	9.56 ± 6.04	0	25	12	
Coughing Blood	Yes	45	12.11 ± 6.10	0	25	13	0.019
	No	919	9.96 ± 5.93	0	25	12	
Weight Loss	Yes	32	10.88 ± 6.42	0	25	12	0.430
	No	932	10.04 ± 5.93	0	25	12	
Chest Pain	Yes	96	11.10 ± 6.06	0	25	12	0.077
	No	868	9.95 ± 5.93	0	25	12	
Difficult Breathing	Yes	169	10.47 ± 6.31	0	25	12	0.214
	No	795	9.98 ± 5.87	0	25	12	
Fatigue	Yes	78	12.10 ± 5.55	0	25	14	0.001
	No	886	9.88 ± 5.95	0	25	12	
Not Know	Yes	416	9.27 ± 6.05	0	25	11.5	0.001
	No	548	10.66 ± 5.81	0	25	12	
Good Nutrition	Yes	38	13.03 ± 4.58	0	25	14	0.004
	No	926	9.94 ± 5.97	0	25	12	
Using of pain killer with vitamin C	Yes	233	12.67 ± 4.70	0	25	14	0.001
	No	731	9.23 ± 6.07	0	25	11	
Proper medication after counseling health provider	Yes	649	9.06 ± 6.10	0	25	10	0.001
	No	315	12.14 ± 5.02	0	25	12	
How to deal with patient infected with pneumococcus	Isolation	163	8.56 ± 6.02	0	18	9	0.001
	I do not know	253	9.68 ± 5.96	0	25	12	
	Free Contact	548	10.69 ± 5.83	0	25	12	
Health Provider	Yes	270	9.86 ± 6.08	0	25	12	0.537
	eenNo	694	10.14 ± 5.90	0	25	12	
Family & Friends	Yes	221	11.02 ± 5.53	0	21	12	0.004
	No	743	9.78 ± 6.04	0	25	12	
TV & Radio	Yes	390	9.60 ± 6.08	0	25	12	0.033
	No	574	10.38 ± 5.84	0	25	12	
Flyers, Posters, or Magazine	Yes	82	10.48 ± 5.70	0	22	12	0.537
	No	882	10.02 ± 5.97	0	25	12	
Social Medias	Yes	1	0.00 ± 0.00	0	0	0	0.156
	No	963	10.07 ± 5.94	0	25	12	

As shown from table 3 there is no significant correlation between education and usage of herbal medicine, take home rest, knowledge about correlation of pneumonia with headache, nausea, weight loss, difficult breathing, health provider, or take their knowledge from flyers, posters, magazine or social media. But there was a significant correlation between education and knowledge of coughing blood, chest pain and they take their knowledge from TV and radio. On the other hand there was a highly significant increase between level of education and their knowledge about association of pneumonia with fever, chills, cough, fatigue and their knowledge about pneumonia, good nutrition, Using of pain killer with vitamin C,Proper medication after counseling health provider, How to deal with patient infected with pneumococcus, they also ask their family and friends home rest and association between pneumonia and fever.

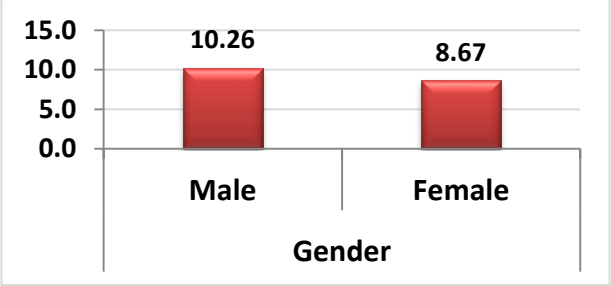

Fig. (13): illustrates that number of educated male was higher than female

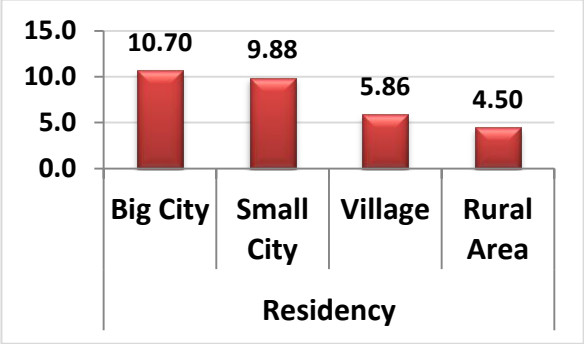

Fig. (14): shows that education is higher in the big cities.

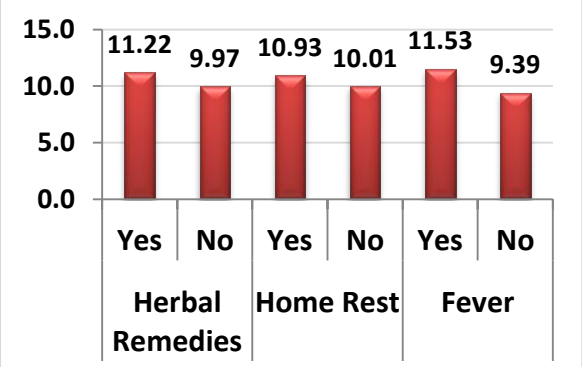

Fig. (15): shows correlation between education and use of herbal medicine.

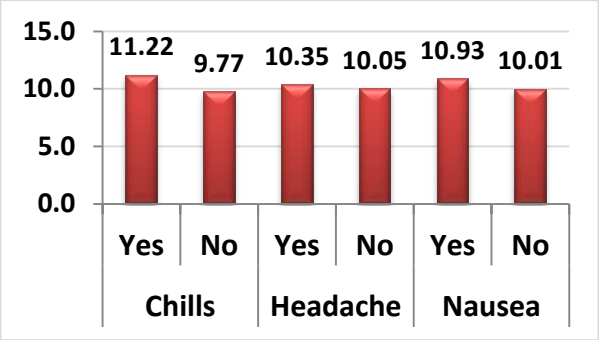

Fig. (16): shows the knowledge of educational Algerian participant and the association of pneumonia and chills,headache and nausea.

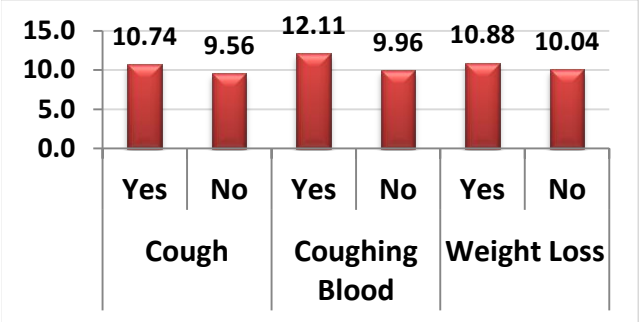

Fig. (17): shows the knowledge of educational Algerian participant and the association of pneumonia and cough, coughing blood and weight loss.

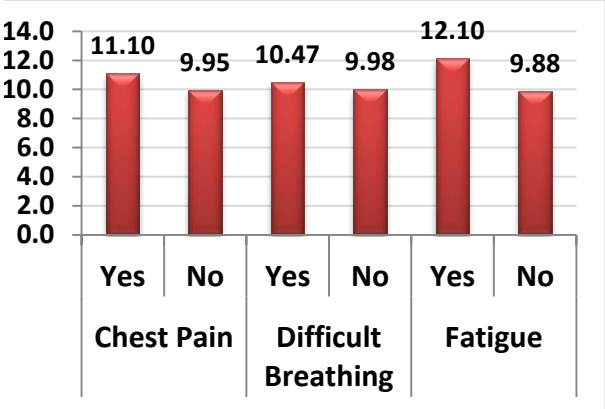

Fig. (18): presents the knowledge of educational Algerian participant and the association of pneumonia and chest pain,difficult breathing and fatigue.

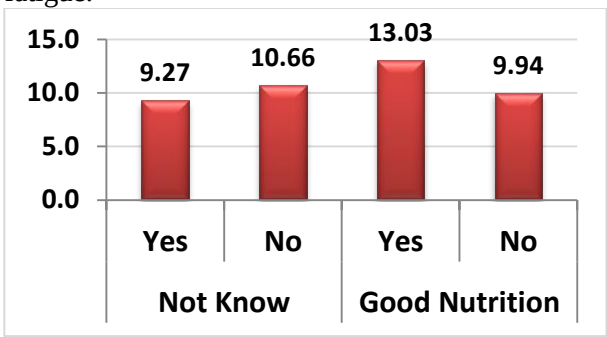

Fig. (19): shows the knowledge of educational Algerian participant about pneumonia and good nutrition

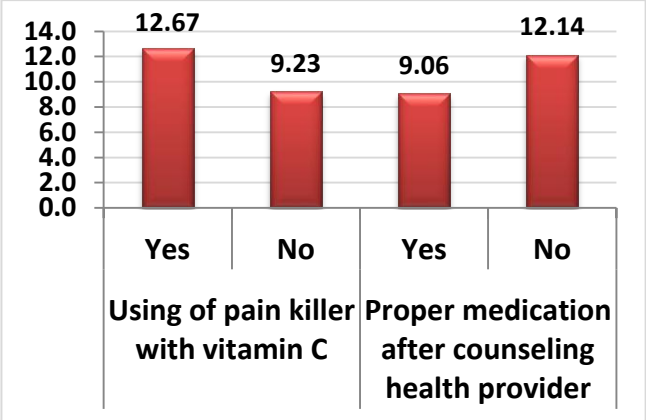

Fig. (20): shows the knowledge of educational Algerian participant about using of pain killer with vitamin C or proper medication after counseling health provider to treat pneumonia.

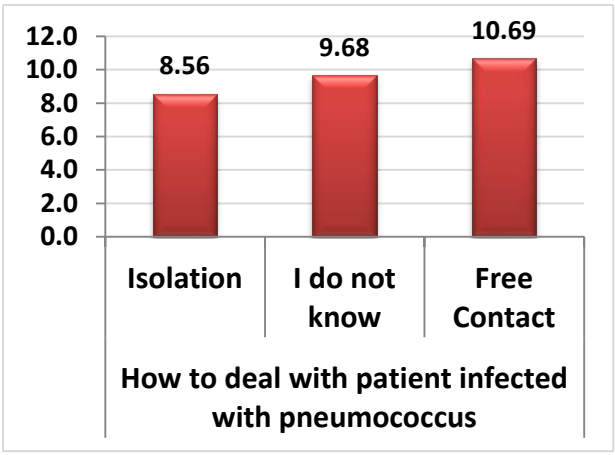

Fig. (21): shows the knowledge of educational Algerian participant about how to deal with patient infected with pneumococcus.

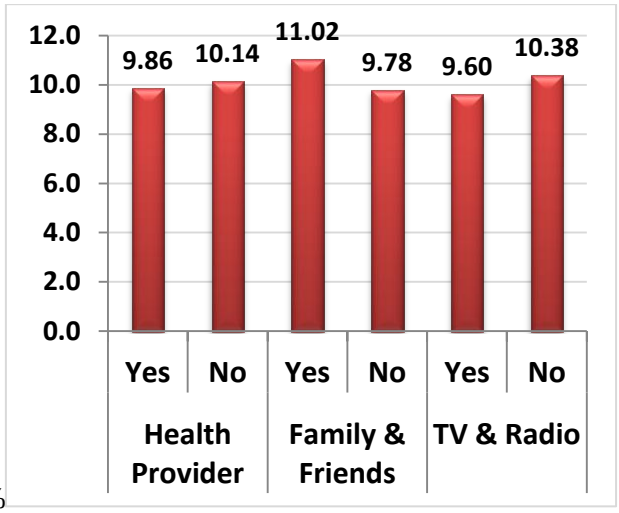

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Fig. (22): shows the knowledge of educational Algerian participant was from health provider, family and friends or TV and radio.

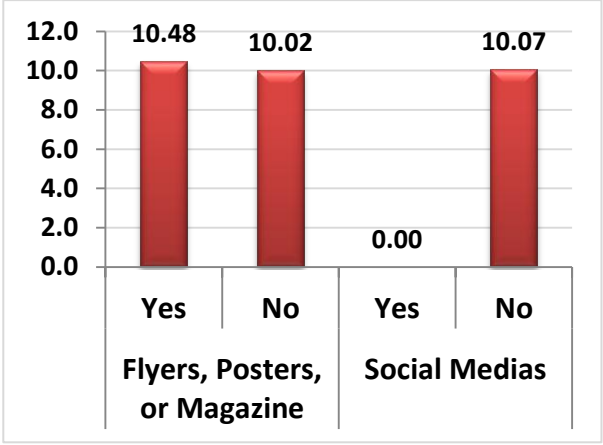

Fig. (23): shows the knowledge of educational Algerian participant was from flyers, posters or magazine, or from social media.

DISCUSSION

The annual Hajj has been connected with a wide range of viral and bacterial upper and lower respiratory tract infections [12]. Pneumonia is a common reason for hospitalization [13]. The probable incidence of respiratory tract infections amid pilgrims ranges from 20 to 80 percent[14, 15]. Understanding the diseases, their causative agents, and modes of transmission can help manage and avoid them.

An earlier study with 200 suspected pneumonia patients concluded that direct laboratory examination of sputum and leukocyte count must be implemented consistently in patients with suspected pneumonia as leukocyte (>25) and epithelial (<10) counts in sputum samples per low-power field seem to be the most significant criterion for expecting a positive culture [16].

A cross-sectional study among all patients admitted to intensive care units in Mina (4 hospitals) and Arafat (3 hospitals) through the 2004 Hajj found respiratory diseases accounted for 47.7% of 140 intensive care unit admissions. Pneumonia accounted for 22.1% of these admissions, and exacerbations of chronic obstructive pulmonary disease accounted for 9.3% [17]. At another two hospitals during the same Hajj season, 42 of 165 persons admitted to the hospital had severe sepsis or septic shock. Pneumonia was the most common source of sepsis (54.8%) [18].

Amid the 2009 and 2010 Hajj years, 452 cases were admitted to hospitals; 49.3% had respiratory ailments, and 27.2% built up a pneumonia-related critical ailment. Of the cases with pneumonia, 18% were contaminated with

gram-negative organisms, 10.6% had gram-positive organisms, and 24.4% had influenza A (H1N1). The mortality rate in individuals with pneumonia was 19.5% [19].

Amid the 2013 Hajj, 38 patients were hospitalized with severe bilateral pneumonia; 22 had bacterial pathogens, with hemophilic influenza and Streptococcus pneumonia being the most well-known. Another 21 people had a distinguished viral disease, with influenza Avirus and human coronaviruses 229E and OC43 being the most common. The mortality rate for patients with bilateral pneumonia was 36.8% [20].Most patients with pneumonia are dealt with experimentally, and the part of microbiological finding with group procured pneumonia is as yet a matter of verbal confrontation. Be that as it may, it is critical to distinguish the pathogens related with notifiable ailments, for example, MERS-CoV, Legionnaires, and Tuberculosis, for which microbiological diagnosis is essential. There are many reasons for the observed low yield. These included prior use of antibiotics and atypical and viral etiologies. In general, K. pneumonia, S. Pneumoniea, H. influenza, S. aureus, P. aeruginosa, and community-acquired MRSA were the most prevalent among patients with a positive culture [21].

Retaining good infection control practice amid healthcare workers is of supreme importance. In a study of 184 healthcare workers for the period of the Hajj, members reported hand hygiene in 98%, cough etiquette in 89%, and wearing a respiratory protective mask in 90% [22]. The Saudi Ministry of Health likewise utilizes different measures to control respiratory diseases among pilgrims that contain the use of face masks or respirators, hand hygiene, preventive vaccinations, and education of participants [23].

The Saudi Ministry of Health arranges with various travel specialists, Muslim committees, and visit coordinators in the regions from where pilgrims come to develop material for education and data required earlier and amid the Hajj [24]. The utilization of educational and communication materials in the Hajj premises by Saudi Ministry of Health amid the 2009 pH1N1 season was related with lessened event and term of respiratory sickness [25]. On the other hand, the scope and adequacy of the educational programs being given before landing to Saudi Arabia is obscure.

RECOMMENDATIONS

- Given our findings, we recommended highlighting be given to pilgrim awareness and education concerning basic infection preventive measures. Sessions should be conducted, or brochures with information on upper respiratory tract infections and their symptoms must be circulated to support pilgrims in pursuing immediate medical support.
- All pilgrims should avoid the spread of respiratory infectious disease such as washing their hands with soap and water or disinfectant, particularly after coughing and sniffling, after using toilets, before handling and consuming food.
- The use disposable tissues when coughing or sneezing, wearing masks, particularly in crowded places.
- Avoidance of direct contact with the individuals who seem ill with a cough, sneeze, or vomiting, not sharing their personal stuff, and preserving decent personal hygiene.
- All pilgrims should report their travel history and prior hospitalization to their healthcare provider in order to consider the possible acquisition of antimicrobial-resistant bacteria and to implement appropriate measures in accordance with national guidelines to prevent the spread of antimicrobial-resistant.
- All pilgrims are recommended to keep their medical records alongside their diagnosis and prescriptions. The generic names of the medications instead of the brand names should also be included.

CONCLUSION

Pneumonia is a main source of serious disease during Hajj and occurs among considerable crowding and pilgrim density. Improved efforts at avoidance for patients at risk prior to Hajj and additional attention to physical crowding during Hajj can reduce this risk. Healthcare employees and pilgrims should strictly adhere to preventive measures.

Severe pneumonia amid Hajj is associated with substantial comorbidities and these may be helpful in recognizing patients at increased risk prior to travel to Saudi Arabia.

ACKNOWLEDGMENT

We are grateful for our colleagues Ibrahim Hussain Nawab, Umm Al-Qura University, Mohammed Mustafa Almarghalani, And Tabuk Surgical Resident for great support and providing facilities during the accomplishment of this work especially the collection procedures and reviewing the scientific data .

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