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Original Research Article

Utility of pneumococcal vaccine among elderly population in buraidah primary health care centers

Sulaiman A. Alawaji*, Chandra S. Kalevaru

Family Medicine Academy, Qassim Health Cluster, Buraidah, Qassim, Saudi Arabia

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***Correspondence:**
Dr. Sulaiman A. Alawaji,
E-mail: sulaiman.alawaji93@gmail.com

ABSTRACT

Background: People with chronic diseases tend to land up with high mortality and morbidity. Objective of the study is to determine the prevalence of Pneumococcal vaccine utility among the 50 years and above age group population, to find the demographic profile, the knowledge of PCV among the general population.
Methods: A cross-sectional study was conducted randomly in 6 primary health care centers in Buraidah city, Saudi Arabia from the aged 50 years and above population. Sample size was calculated by using WHO statistical software for sample size determination, the result of sample size was 236 participants. A interview-based questionnaire was used after obtaining consent from each participant. Data entered and analyzed using the SPSS software 21.0 version. For categorical analysis, chi square test was applied.
Results: In the present study, a total of 202 samples of the population has participated and response rate was 86%. About only 12.9% (26/202) of study population taken PCV vaccine in the study. About 79.7% were having different chronic diseases. About 83.7% were given a response as PCV prevents the disease. There was statistically significant association was observed between different levels of education and chronic heart disease with PCV vaccination status ($p<0.05$).
Conclusions: Based on the study results, Pneumococcal vaccination coverage was low, in comparison with Riyadh study in 2018; our study vaccination coverage was more. Still need Health promotional measures among the general public to increase the coverage of PCV.

Keywords: PHCC, Pneumococcal vaccine, Knowledge, Chronic disease

INTRODUCTION

Streptococcus pneumoniae has high morbidity and mortality cases especially in Saudi Arabia, this could be due to as high numbers of yearly visitors for Hajj and Umrah.[1,2] *Streptococcus pneumoniae* can affect all age populations but there is a high-risk group with children <2 years old, elderly people, acquired or congenital immunodeficiency, malignancy, and chronic liver, heart, and lung disease.[2,4] A study from Mecca revealed that infection of elderly people is higher (57.9%) than children infection (36.8%).[3] The spectrum of pneumococcal disease would be ranging from asymptomatic to fulminant disease.[2] *Streptococcus pneumoniae* could develop in either pneumococcal pneumonia or invasive pneumococcal disease and there is a risk of antibiotic resistance.[4] It can cause pericarditis, sinusitis, otitis media, endotracheal obstruction, and pneumonia. It could complicate travel the body causing septicaemia, meningitis, endocarditis, and others.[2] Multi-drug resistance became difficult over the years for this common infection. A study from Saudi Arabia showed resistance to TMP/SMX (trimethoprim and sulphamethaxazole) antibiotic about 65%.[5] And a newer study suggests 22% penicillin resistance.[6] More recently >50% resistance to penicillin.[7] *Streptococcus pneumoniae*

is a gram-positive diplococcus surrounded by polysaccharide capsule hence it is resistant to phagocytosis and plays a role in its protection. The organism is transmitted from an infected individual to a healthy one by air droplets.[8] A major distinctive risk factor for pneumococcal disease for Saudi Arabia is Hajj, during Hajj over 2 million pilgrims from multiple countries gather in Mecca.[9] During this period, pneumonia accounts for one-third of the hospitalizations in Saudi Arabia.[10] PCV23 is made of capsular polysaccharides from 90% of the most common infections a23 serotypes.[11] The PCV23 is given at least once in a life. In immune-competent aging 50 and above should get one dose of PCV13 followed by PPSV23 after 1-year.[12] The pneumococcal vaccine had been introduced in 151 Countries at the end of 2020.[13] Countries have implemented routine immunization programs and recommendations for routine pneumococcal vaccination which do offer in 29 European countries.[14] Given the above situations and circumstances, the present study was designed to identify the Pneumococcal vaccine coverage and knowledge among the general population aged above 50 years age group and to promote the health promotional measures at our regular practice at primary health care centers in Buraidah city.

Aim and objectives

Aim of the current study was to determine the prevalence of Pneumococcal vaccine coverage among elderly patients attending the PHCs of Buraidah city. Objectives of the study were to assess the awareness and knowledge of Pneumococcal vaccine amongst the population of elderly patients, to determine the prevalence of chronic diseases amongst elderly patients and their associations with the vaccine and to identify the limitations for refusing to take the vaccine.

METHODS

Description of the study area and location

Buraidah is the capital of Al-Qassim Region in northcentral Saudi Arabia in the heart of the Arabian Peninsula. The city has experienced very high rates of population growth. There are 44 Primary Health Care Centers in Buraidah city.

Study design and setting

This was a cross sectional study carried out in the primary health care centres of randomly selected health care centers in Buraidah city. These six health care centers were Al Dahy, Al Iskan, Al Shimas, Al Ufuq, Al Rawdah and Al Rayyan.

Sampling method

In relation to selection of primary health care centres (PHCC), due to the large number of primary health care centres in Buraidah, which were around 44, we randomly selected 6 primary health care centres (15% of total PHCC in the Buraidah city). For the study participants selection, we included all patients aged 50 years and above who were coming to primary health care centres during our visit on the day of our data collection.

Sample size

Sample size was calculated using WHO statistical software for sample size determination.[15] With 95% confidence level, 4% margin of error and population proportion was 11%, the result of Sample size was 236 participants. Population proportion was taken from "pneumococcal vaccination rates in adults in Germany" research.

Study period

This study was conducted from July 2020 to September 2021. In the month of September data analysis, interpretation, report writing and review with supervisor were done.

Target population

All the elderly patients aging 50 years old and above visiting primary health care centres at the time of our visit to those primary health care centres.

Exclusion criteria

The study excluded patients younger than 50 years old. The study also excluded those with psychiatric illnesses that may interfere with complete and adequate data collection.

Inclusion criteria

The study will include patients aging 50 years old and above who visited one of our chosen primary health care centres at the time of our visits.

Method of data collection

An interview-based questionnaire used for data collection. The questionnaire designed and organized to study the prevalence and knowledge of Pneumococcal vaccine; as well as reasons for taking or refusing to take the vaccine. The questionnaire included 2 sections. The first section aimed to gather data about the general information about the participants. The second section evaluated the vaccine status and patients' opinions and views about the pneumococcal vaccine. Prior to the collection of data, the patient informed about the details and goals of the study and advised to answer the verbal questionnaire completely and truthfully. The participants were asked to take a written consent before each questionnaire. We assured that all information will be kept completely confidential and this questionnaire is

anonymous. Data collection done by the principal investigator (first author) and three trained final year Family Medicine residents on 23rd of May and continue for about 30 days. The data collectors were also asked to inform each participant about the purpose of the study explained verbally and also written in the questionnaire. They also tasked to ask the participant questionnaire verbally. They were also informed to take written consent before each questionnaire. We included all the male and female patients at primary health care centres and those were selected and willing to participate in the study voluntarily at the time of our visit. On average of 8 to 12 participants data collected per day. All of 6 primary health care centres directors allowed us to do our study and patients were willing to participate in our study. At the end, it took one week for the first author to code the questionnaires and enter the data in Statistical package for social sciences (SPSS).

Questionnaire

The questionnaire has gone through various efforts to reach its final draft and form. At the start, we found similar study done at out-patient appointment clinics in the family medicine department at Security Forces Hospital in Riyadh for patients with type 2 diabetes. We used the main frame and general content of this questionnaire as the questionnaire included 3 sections. The first section aimed to gather demographic data about the population. The second and the third sections assessed the vaccines uptake status, and patients' opinions and beliefs about the influenza and pneumococcal vaccines. Next we started modified this questionnaire to meet our goals, we first removed the second section that use to take about the influenza vaccine, becoming two section questionnaire, and then we modified the questionnaire so to be the first section became about the general information about the participants, and the second section evaluated the vaccine status and patients' opinions and views about the pneumococcal vaccine. The updating in the questionnaire done by the first author and the supervisor. Finally approved as a final questionnaire and tool to evaluate the awareness and knowledge of Pneumococcal vaccine, to determine the prevalence of chronic diseases amongst elderly patients that have taken the vaccine, and to identify the reasons for taking, or refusing to take the vaccine.

Section A

General information: we took the age, gender, level of education as (illiterate, high school or less, diploma/bachelor, or post graduate (master, PhD etc.), marital status, smoking (smoker, non-smoker, former smoker). Past history: Diagnoses with chronic diseases as diabetes, hypertension or dyslipidaemia. Diagnoses with chronic lung disease, chronic heart disease, chronic kidney disease, chronic liver disease, sickle cell disease, suppressed immune, system removed spleen/ malfunctioning spleen. Medications were also asked about. These questions asked if there and for how long. Vaccinations: If any recommendation about any vaccination as an adult, and if there is any allergy to any vaccine that had been taken. These questions to help us categorize them for evaluation and comparison. And evaluate the relation between those factors and their awareness and knowledge.

Section B

Pneumococcal vaccine: questions from 1 to 5 talks about awareness of the pneumococcal vaccine, pneumococcal vaccine status, the number of times taken the vaccine, the person to advised to take the vaccine (doctor, practice nurse, media, family/friends, or others)**.** Statements about Pneumococcal vaccine: question 6 take us to participants views about importance of elderly to get the pneumococcal vaccine, the pneumococcal vaccine works in preventing the pneumococcal disease, having enough time to get the vaccine, worrying about the side effects of the pneumococcal vaccine, worrying that the pneumococcal vaccine may be painful, and others.

Data analysis

Statistical analysis was done by using the statistical software SPSS-21.0 version. A descriptive analysis was done for certain variables like age, sex, years of experience, qualification. For the categorical analysis of variables chi square test was applied. Multiple logistic regression analysis was done to assess the factors associated with good score. The level of significance of probability (p) was considered as 'p' less than equal to 0.05.

RESULTS

In the present study, a total of 202 sample of population was participated. Mean age in the study population was 65.11± 9.34. About 75% of the study population under 71 years of age group. Age range of the study population from 50 years to 92 years in the present study. In this study, distribution of males were 62.4% and females were 37.6%. In the study population, mean diabetes duration and standard deviation was 9.31±12.37, hypertension mean duration and standard deviation was 8.25±9.1 and dyslipidaemia mean duration and standard deviation was 5.52±8.84. In the study population, regarding advise to take vaccine, about 8.9% were received advise from the doctor, 2% from family friends, 1.5% from media and 0.5% from the nurse. In the study population, about 35.1% were in the age group of 60-69 years age (Table 1). About 93.6% were married persons participated in the study. About 22.3% were illiterate people and this could be due to our study age criteria is above 50 years age group and majority of old age people were participated and high school or less completion people were 53.5%.

Table 1: Demographic characteristics in the study population.

Demographic factors	N	%
Age categories (years)		
50-59	64	31.7
60-69	71	35.1
70-79	56	27.7
Above 80	11	5.4
Gender		
Males	126	62.4
Females	76	37.6
Marital status		
Married	189	93.6
Single	4	2.0
Others (divorced/widow/widower)	9	4.4
Education		
Illiterate	45	22.3
High school or less	108	53.5
Diploma and Bachelor	44	21.8
Post graduation and above	5	2.5
Smoking		
Smoker	13	6.4
Non-smoker	186	92.1
Former smoker	3	1.5
Total	202	100.0

In the study population, about 6.4% were smokers. About only 12.9% (26/202) of study population taken PCV vaccine and 87.1% (176/202) were not taken the PCV vaccine (Figure 1). In the present study, about 79.7% were having different chronic diseases (Table 2). About 59.4% were having Diabetes, 65.3% were having hypertension and 40.1% were dyslipidaemic status in the present study. In the study population, among the diabetes and hypertension morbidity individuals were taken PCV vaccine 11.6% and 11.4% respectively (Table 3). There was no significant difference was observed between participants intake of PCV vaccine versus chronic disease morbidity ($p>0.05$). In the study population, about 5% were having heart disease. About 83.7% were given response as PCV prevents the disease (Table 4). Among them, 23.6% were mentioned as worried about side effects of PCV vaccine. In the study population, about 85.6% of the study group aware about PCV vaccine and only 12.9% were received the PCV vaccine. For the question of number of times of administration of vaccine, only 4% were answered as two shots are required in the elderly people. In the study group, there was marginal difference of PCV vaccination difference was observed in males and females (M:F-12.7% and 13.2%). There was statistically significant association was observed between different levels of education versus and PCV vaccination status ($p<0.001$). Higher the education better the PCV vaccine status. (Post graduation and above completed 80% PCV received vs. high school or less education 6.5% PCV received). There was statistically significant association was observed between vaccination status and chronic heart disease ($p=0.001$) (Table 6).

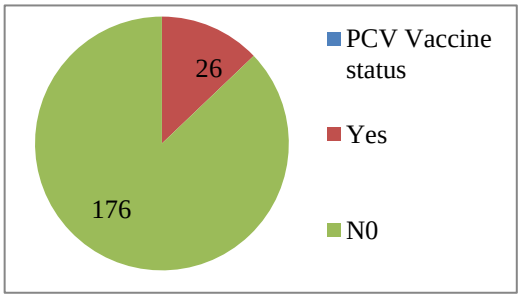

Figure 1: Pneumococcal vaccination (PCV) status in the study population.

Table 2: Chronic disease status in the study population.

Chronic disease	N	%
Yes	161	79.7
No	41	20.3
Diabetes - Yes	120	59.4
Diabetes - No	82	40.6
Hypertension - Yes	132	65.3
Hypertension - No	70	34.7
Dyslipidaemia - Yes	81	40.1
Dyslipidaemia - No	121	59.9

DISCUSSION

Our study was conducted in the selected primary health care centers in Buraidah city during the period from July 2020 to September 2021 as per the study guidelines to see the main objective of assessing the awareness and knowledge of Pneumococcal vaccine amongst the population of elderly patients aged 50 years and above. Very few studies were conducted on awareness and knowledge about the Pneumococcal vaccine among the above said population in the globe as well as in Saudi Arabia. In the present study, a total of 202 samples of the population had participated. The mean age in the study population was 65.11±9.34 years of age. The age range of the study population was 42 years in the present study. In comparison, a study was done in Turkey revealed that the mean age and standard deviation of age 57.7±11.3 years.[16] In another study which was also conducted in Turkey at department of internal medicine, the mean age and standard deviation were 57.9±10.7 years.[17] These differences of mean age could be due to the beginning age selection in this study and in the above two studies selected their age criteria taken from 18 years and above age group population and in our present study taken age criteria as 50 years and above age group.

In the present study, about only 12.9% (26/202) of the study population had taken the Pneumococcal vaccine.

Table 3: Chronic morbidity in relation to PCV vaccination status in the study population.

Chronic morbidity	PCV received N (%)	PCV not received N (%)	Total N (%)
Diabetes -Yes	14 (11.6)	106 (88.4)	120 (100)
Diabetes -No	12 (14.6)	70 (85.4)	82 (100)
X^2 -0.383, 1df, P-0.536, OR-1.254, CI -.337 to 1.763.			
Hypertension - Yes	15 (11.4)	117 (88.6)	132 (100)
Hypertension - No	11 (15.7)	59 (84.3)	70 (100)
X^2 -0. 772, 1df, P-0.380, OR-1.383, CI - 0.297 to 1.591			
Dyslipidaemia - Yes	11 (13.6)	70 (86.4)	81 (100)
Dyslipidaemia - No	15 (12.4)	106 (87.6)	121 (100)
X^2 -0.061, 1df, P-0. 806, OR 0.913, CI: 0.482 to 2.558.			
Status of other co-morbidities like chronic lung, heart and kidney disease status			
Other co-morbidities	Yes	No	Total
Chronic lung disease	2 (1)	200 (99)	202 (100)
Chronic heart disease	10 (5)	192 (95)	202 (100)
Chronic kidney disease	1 (0.5)	200 (99.5)	202 (100)
Medication	159 (78.7)	43 (21.3)	202 (100)

X^2 - Chi Square test, df - degree of freedom, OR- Odd's ratio, CI - confidence interval, p-probability.

Table 4: Knowledge about participants response in relation to Pneumococcal vaccine.

Knowledge about PCV	Yes	No	Total
PCV vaccine important for elderly people	161 (79.7)	41 (20.3)	202 (100)
PCV Prevents Disease	169 (83.7)	33 (16.3)	202 (100)
Worried Side Effects PCV	43 (23.6)	159 (76.4)	202 (100)
PCV Painful	26 (12.9)	176 (87.1)	202 (100)
Enough time get PCV	47 (23.3)	155 (76.7)	202 (100)
Awareness about PCV			
Heard of PCV before	29 (14.4)	173 (85.6)	202 (100)
PCV received status	26 (12.9)	176 (87.1)	202 (100)

Table 5: Some demographic variables association with PCV vaccination status in the study population.

Socio demographic factors	Vaccination not received N (%)	Vaccination received N (%)	Total N (%)
Age groups (years)			
50-59	54 (84.4)	10 (15.6)	64 (100)
60-69	64 (90.1)	7 (9.9)	71 (100)
70-79	50 (89.3)	6 (10.7)	56 (100)
Above 80	8 (72.7)	3 (27.3)	11 (100)
X^2 -3.274, 3df, p=0.351			
Gender			
Male	110 (87.3)	16 (12.7)	126 (100)
Female	66 (86.8)	10 (13.2)	76 (100)
X^2 - 0.009, 1df, p=0.925, OR - 1.042, CI-0.447 to 2.430			
Marital status			
Married	167 (88.4)	22 (11.6)	189 (100)
Single	3 (75)	1 (25)	4 (100)
Others; divorced/widow/widower	6 (66.7)	3 (33.3)	9 (100)
X^2 - 4.14, 2df, p=0.126			
Education			
Illiterate	39 (86.7)	6 (13.3)	45 (100)
High school or less	101 (93.5)	7 (6.5)	108 (100)
Diploma and bachelor	35 (79.5)	9 (20.5)	44 (100)
Post graduation and above	1 (20)	4 (80)	5 (100)
X^2 -26.28, 4df, p=0.001			

Table 6: Logistic regression analysis of some chronic conditions variables with Pneumococcal vaccination in the study population.

Variables	Adjusted OR	Confidence interval	P value
DM Category (yes, no)	1.659	0.573 to 4.806	0.351
DM Category (yes, no)	1.851	0.661 to 5.187	0.241
Dyslipidaemia (yes, no)	0.884	0.264 to 2.959	0.841
Chronic heart disease (yes, no)	0.080	0.017 to 0.364	0.001

To compare the present study finding, a study was conducted in the family medicine department at security forces hospital in Riyadh, Saudi Arabia found out that 93.9% of participants reported not received the pneumococcal vaccine, 3.3% replied as don't know and 2.8% were received pneumococcal vaccine.[11] In a study of a cross-sectional survey among the Gulf cooperation council (GCC) countries' residents, overall 22% of the participants reported receiving the pneumococcal vaccine in the three years previous to the survey and the remaining 78% reported not receiving the vaccine. The vaccine coverage rate varied broadly across the countries, ranging from 0% in Bahrain 7% in Saudi Arabia to 79% in Kuwait.[18] In another study from a tertiary care diabetes center in Thailand, the overall vaccination rate was 17.4% for the pneumococcal vaccine.[19] A study conducted by Akihiro Sakamoto of club members in Miyakonojo city, Japan stated that the pneumococcal vaccination rate was 53.2%.[20] Another study conducted in Australia among general populations in above 65 years age group revealed that PCV coverage was 36% among 65-74 years age group.[21,22] In the Brazil, one more study was conducted at tertiary care hospital aged 33-72 years, the PCV coverage mentioned as PPV 23 alone and PCV 13 plus PPV 23 coverage was 31.4% and 50.8% respectively.[23]

The changes in pneumococcal vaccine uptake in these studies could be due to inclusion criteria of age factors, medical history, different study settings like primary health care centers, internal medicine departments, the latest updating in the guideline of pneumococcal vaccine age, each country program for vaccinating its elderly population and special guidelines about Pneumococcal vaccination for the Hajj and Umrah visits in the country. In the present study, participants who received the vaccine with chronic diseases among the diabetes and hypertension morbidity individuals were taken Pneumococcal vaccination 11.6% and 11.4%, dyslipidaemia 13.6%, other comorbidities as chronic heart disease 5%, chronic lung disease 1% and chronic kidney disease 0.5%. A study survey among the Gulf cooperation council (GCC) countries' residents found out the coverage rate, the coverage rate among participants with chronic kidney disease, those with lung diseases, heart diseases and diabetes was in that order, 30% (3/10), 52% (12/23), 32% (7/22) and 20% (31/152).[18]

Similarly, a study conducted in Turkey by department of internal medicine, Istanbul, stated that the rate of vaccination for Pneumococcal vaccine with hypertension was 9%, coronary artery disease 3%, chronic kidney disease 3%, and for chronic lung disease 9%.[17] In a study conducted in South Korea, distribution of high-risk population and coverage rates of Pneumococcal vaccination in the pre-campaign, diabetes was 30%, cardiovascular disease 3.7%, chronic lung disease 3.3% and chronic kidney disease 3.5%.[8] On another hand, a study conducted by Akihiro Sakamoto, Japan detailed a description about the vaccination status of participants with diabetes mellitus 12.3%, heart disease 9.9%, respiratory disease 7.9% and renal disease 3.4%.[20] The fluctuation of underlying chronic diseases and co-morbidities could be due to the prevalence of these diseases in each country, the ages of the participants, and the different study settings like primary health care centers or hospital settings including tertiary care centres. In this study, mentioned that 83.7% were given a response as the Pneumococcal vaccine prevents the disease. Of which, 23.6% were mentioned as worried about the side effects of the vaccine. Study participants were mentioned as the Pneumococcal vaccine may be painful about 12.9%, participants are shown as not enough time to get Pneumococcal vaccine was 23.3%. In the study population, about 14.4% were aware of the Pneumococcal vaccine and only 12.9% were received the PCV vaccine. A Riyadh Study for diabetes patients, revealed that the participants did not recognize the importance for patients with diabetes mellitus to get vaccinated with the pneumococcal vaccine (320/360, 88.9%).[11] 24/360 (6.7%) respondents were opined that it was important and 16/360 (4.4%) respondents revealed that as not important. A major portion of the participants reported that they didn't realize that the vaccine worked in preventing pneumococcal infections (316/360, 87.8%). In their study, about 8.3% reported that the vaccine works in preventing pneumococcal infections. The majority of the participants reported not having enough time to get the pneumococcal vaccine (248/360, 68.9%).

A study reported that 38/360 (10.6%) participants stated that they were worried. Likewise, most reported that they were not worried about painful vaccination (68/360, 18.9). 28/360 (7.8%) of respondents were reported that worried about the vaccine being painful.[11] In the study done by department of internal medicine, Korea university college of medicine, Korea, as pre-campaign among the high risk of non-vaccine participants gave 0.9% of not sure about the vaccine efficacy, 1.3% were not having enough time for vaccination, 0.9% were worried of needle injections.[8] Most of the barriers to not

taking the vaccine could be the lack of education and information about the efficacy and side effects of the vaccine. The stigma about vaccination in general, participants also noted the lack of time to take the vaccine. But the most important aspect was the lack of awareness of the vaccine itself 85.6% of the population were not aware of the vaccine at existing for use at Primary health care centers of Saudi Arabia.

Limitations

Limitations of current study were; out of the randomly selected primary health care centres directors, one of PHCC director was not accepted to collect the data from his PHCC, as a result of this, we changed another PHCC randomly. Some participants refused to give consent to the study and they mentioned reasons as limited time and realization of the study for their benefit. Some of the data collectors submitted incomplete forms, these uncompleted forms were not included in the main study.

CONCLUSION

In the present study, only 12.9% participants received Pneumococcal vaccination. Majority of the participants were mentioned as not aware of PCV and some revealed as side effects of the vaccine for not taking the vaccine. In the current study almost four fifth of the participants were having chronic morbidity. There was significant association was observed with Pneumococcal vaccine versus higher education people. Health promotional measures like information, education and communication measures to be taken care periodically about importance of Pneumococcal vaccine coverage and its benefits to elderly people at primary health care level.

Recommendations

Based on the study findings, health awareness programs to be strengthened to increase the Pneumococcal vaccine coverage and to get the prevention from Pneumonia among elderly people with co-morbidity.

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