

ORIGINAL ARTICLE

AWARENESS AND KNOWLEDGE SHARING AMONG PHYSICIANS REGARDING INFLUENZA AND PNEUMOCOCCAL VACCINES FOR CARDIOVASCULAR PATIENTS

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Objectives: We conducted this survey to evaluate the knowledge of cardiologists, internists, and family physicians regarding influenza and pneumonia vaccination among cardiovascular disease (CVD) patients.

Methodology: An online survey was conducted including practicing cardiologist, internists, and family physicians at various positions working in tertiary health care centres of all major hospitals in all over the Pakistan. A structured questionnaire was designed to assess the physicians' knowledge toward influenza and pneumococcal vaccine and barriers for prescribing it to the recommended CVD patients.

Results: A total of 380 physicians participated in this survey, out of which 58.9% (224) were male and majority 96.3% (366) were ≤ 40 years of age. A 82.6% (314) participants indorsed that the pneumococcal vaccine is Class I indication in cardiac patients above 65 years of age, while, 48.2% (183) considered it to be recommended by the ACC/AHA in all age groups of cardiac patients. Pneumococcal vaccine are considered to be live attenuated vaccines by the 41.8% (159) of the participants. The mean knowledge score was found to be 63.09 ± 13.61 . The most common stated reasons for not prescribing pneumococcal vaccine was not readily available, 42.9% (42), followed by the perception that it is not indicated, 36.7% (36).

Conclusion: Most of the physicians were not thoroughly well-aware about indications of the vaccine in CVD patients. Additionally, scope of the vaccine is under-estimated because of lack of knowledge regarding importance of vaccine and secondly due to unavailability of vaccine in most of the areas of Pakistan.

Keywords: cardiovascular disease, influenza, pneumococcal vaccine, knowledge, physicians

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INTRODUCTION

There is an abundance of literature that suggests influenza spread in the winter and autumn season is the real culprit that increases cardiovascular events. An innumerable number of investigations through case-only studies, case-control studies, cohort studies, and ecological studies to find the association of burden between cardiovascular disease and influenza. The result however in these studies reflect differentiation and fluctuate conclusions.¹ It is also stated with the mounting evidence that cardiovascular adverse events along with high mortality can be triggered by the only influenza mostly. It has been proved that prothrombotic cytokines, induction of procoagulant activity and inhibition of anticoagulant mechanisms, increase in the expression of tissue factor, increased plasma viscosity, endothelial dysfunction, increase in trafficking of macrophages into the arterial wall, an increase in pro-inflammatory, reduction in the clotting time, release of endogenous catecholamines, stimulation of platelet activity, loss of the anti-

inflammatory properties of HDL particles, increased shear force, tachycardia, hypoxemia, psychological distress, and dehydration are the number of the mechanism associated between cardiovascular events and all kind of respiratory infection.²

All the patients either in the presence of kidney failure, nephrotic syndrome, splenic injury or asplenia, Hodgkin's disease, HIV infection, lymphoma, leukemia, multiple myeloma, or organ transplant, smokers aged 19 to 64 years, or under long-term steroids, radiation therapy or cancer treatments, or patients with COPD and asthma, or immunocompromised patients 2 through 64 years recommended to should have vaccinated against Streptococcus pneumonia.

World Health Organization declares patients who are in a high-risk group, have certain severe chronic conditions, and are of older age, are declared to have influenza vaccination as their primary protecting agent.³

Respiratory vaccination act as Antigen Mimicry in the association of antigens of the atherosclerotic plaque and infectious agents. Bradykinin 2 receptor recognized as mediated molecular protein host work in cardioprotective effect during influenza vaccination.³ Furthermore, vaccine-induced antibody cross-reacts on human bradykinin receptors would be helpful to scrutinize the protective effect of vaccination in a putative molecular mechanism. Influenza vaccination helps in nitric oxide abundance which directly increases the level of oxygen, enhances vasodilation through increase blood flow, and possible angiogenesis.⁴ The production of interleukin-1 beta and TNF- α can independently depress myocyte contractility during acute illness, In addition, sustained cytokine expression can lead to excess production of tissue inhibitors of matrix metalloproteinases and adverse myocardial remodeling. Associated mechanisms enhance left ventricular dilatation and increase myocardial collagen content in contribution to the HF phenotype.⁴

The first official real-world report on the pattern of influenza vaccination among cardiovascular diseases patients was conducted by the Centers for Disease Control and Prevention in “Behavioral Risk Factor Surveillance System survey-2018 to 2019”.⁵ According to the statistics of this report total of 101, 210 of coronary heart disease, heart attack, or stroke who were asked to take influenza shots last year were investigated. The astonishing result of strikingly very low i.e., 50.4% population had up-to-date vaccination record. These results do not differ in any gender as well.⁵

The appropriate influenza vaccination dose is still controversial. In a pilot randomized study in heart failure, 28 patients were administered either a double dose of 30 μ g/strain or a standard dose of 15 μ g/strain of influenza vaccination. Patients receiving double dose reported increase immunogenicity with two to four weeks beside absolute antibody titers with high seroprotective levels found similar in double and standard-dose groups.⁶ The novel approach of active immunization against inflammation and atherosclerosis is considered the vital function to have immune-mediated inflammation in atherogenesis.⁶ A recent study enlightens the greater adherence of influenza vaccination of heart failure in respect to ACC/AHA heart failure quality measures among high-performing centers and suggested to promote high quality care the best practice is to adopt a structural intervention through a system level. They further suggest facilitating hospitalized patient's electronic or computerized reminders for influenza vaccination should be used. On top of that, the best exercise to

improve vaccination rates among high-risk cardiovascular patients is to enhanced educational efforts, clinician and patient engagement, reductions in barriers, and novel strategies for improving access.⁷ In the light of all crucial findings to adopt a systematic approach to facilitate influenza and pneumonia vaccination among coronary artery disease patients, we design a cross-sectional multicenter study to evaluate and enhance the knowledge of cardiologists, internists, and Family physicians.

METHODOLOGY

After the approval from the ethical review committee of the National Institute of Cardiovascular Diseases, Karachi, Pakistan, an online survey was created using Google Forms. Survey started by taking consent of the participant for her/his participation in the survey, expected time it may take to complete, and no objection regarding use of collected data for research and publications. Information regarding participants' specialty, area of work (private/public), years of experience, qualification, and geolocation were obtained. The target population was practicing cardiologist, internists, and family physicians at various positions working in tertiary health care centers of all major hospitals in all over the Pakistan.

A structured questionnaire was designed and validated which consisted of separate sections for (a) socio-demographic data; (b) physicians' knowledge toward influenza and pneumococcal vaccine recommendations by AHA/ACC; (c) what is the mechanism of action of influenza and pneumococcal vaccine in preventing the mortality in cardiovascular diseases (CVD) patients, (d) knowledge regarding potential benefits of these vaccines in recommended CVD patients (e) knowledge regarding the target population with CVD that requires flu and pneumococcal vaccines, and (f) reasons preventing the physician from prescribing vaccination in recommended CVD patients

A total knowledge score for each participant was computed as percentage of correct answer by designating one point for each correct answer, whereas the wrong answer were given zero. Knowledge level on overall basis as well as on the individual component along with the demographic data were analyzed using IBM SPSS version 21. Descriptive statistics such as mean \pm SD and frequency (%) will were calculated. Knowledge level among various sub-groups of the participants were compared by applying independent sample t-test or Chi-square test appropriately. The level of significance will be set at ≤ 0.05 throughout the study.

RESULTS

A total of 380 healthcare professional participated in this survey, out of which 58.9% (224) were male and majority 96.3% (366) were ≤ 40 years of age. A majority of the participants, 278 (73.2%), had ≤ 5 years of experience in dealing CVD patients.

A 82.6% (314) participants indorsed that the pneumococcal vaccine is Class I indication in cardiac patients (post ACS, HF and SIHD) above 65 years of age, 67.1% (255) believe it is not recommended in all age group of cardiac patients, while, 48.2% (183) considered it to be recommended by the ACC/AHA in all age groups of cardiac patients. Pneumococcal vaccine are considered to be live attenuated vaccines by the 41.8% (159) of the participants.

In response to the question regarding possible mechanism involved in the increased mortality with influenza and pneumococcal diseases in cardiac patients, a majority, 58.9% (224), endorsed all four of the listed possible mechanisms namely, enhanced sympathetic activity, hypoxemia sec to infection,

inflammatory release of cytokines, and coronary plaque disruption, and thrombogenesis, which may result in thrombotic occlusion of the coronary artery. Similarly, a majority, 80.5% (306), believe estimates of the efficacy of influenza vaccine in preventing AMI. Majority, 90.3% (343), of the participant were aware of PCV13 and PCV23 type of pneumococcal vaccine.

The most common stated reasons for not prescribing pneumococcal vaccine was not readily available, 42.9% (42), followed by the perception that it is not indicated, 36.7% (36) (Table 1).

The mean knowledge score was found to be 63.09 ± 13.61. Knowledge level was found to be associated with years of experience with mean knowledge score of 62.2 ± 13.81 vs. 65.51 ± 12.81; p=0.035 for participants with ≤ 5 years and > 5 years of working experience respectively. Other demographic variables were found to have no significant impact on mean knowledge level as presented in Table 2.

Table 1: Demographic characteristics and knowledge regarding pneumococcal vaccine for cardiovascular diseases patients

Characteristics	Total	Years of Practice		P-value
		Up to 5 years	> 5 years	
Total (N)	380	278 (73.2%)	102 (26.8%)	-
Gender				
Male	58.9% (224)	49.6% (138)	84.3% (86)	<0.001
Female	41.1% (156)	50.4% (140)	15.7% (16)	
Age				
Up to 40 years	30.21 ± 6.4	28.05 ± 3.39	36.1 ± 8.61	<0.001
More than 40 years	96.3% (366)	100% (278)	86.3% (88)	
Area of work				
Public Sector	87.6% (333)	87.1% (242)	89.2% (91)	0.570
Private Sector	12.4% (47)	12.9% (36)	10.8% (11)	
Education Level				
Graduate	61.3% (233)	69.4% (193)	39.2% (40)	<0.001
Postgraduate trainee	38.7% (147)	30.6% (85)	60.8% (62)	
A. Knowledge Assessment regarding Pneumococcal Vaccine				
Recommended in all age groups of cardiac patients according ACC/AHA guidelines	48.2% (183)	47.1% (131)	51% (52)	0.505
Class I indication in cardiac patients (post ACS, HF and SIHD) above 65 years of age	82.6% (314)	83.1% (231)	81.4% (83)	0.695
Influenza vaccine is not recommended in all age group of cardiac patients (post ACS, HF and SIHD)	67.1% (255)	64.7% (180)	73.5% (75)	0.106
B. These vaccines are live attenuated vaccines	41.8% (159)	44.6% (124)	34.3% (35)	0.072
B. Mechanism involved in the increased mortality with influenza and pneumococcal diseases in cardiac patients				
Enhanced sympathetic activity	5.8% (22)	6.5% (18)	3.9% (4)	0.345
Hypoxemia sec to infection	17.1% (65)	20.5% (57)	7.8% (8)	0.004
Inflammatory release of cytokines	22.9% (87)	27.7% (77)	9.8% (10)	<0.001
Coronary plaque disruption, and thrombogenesis, which may result in thrombotic occlusion of the coronary artery	15.8% (60)	17.6% (49)	10.8% (11)	0.105
All above	58.9% (224)	51.8% (144)	78.4% (80)	<0.001
C. Estimates of the efficacy of influenza vaccine in preventing AMI	80.5% (306)	77.3% (215)	89.2% (91)	0.01
D. Section D				
There are two types of pneumococcal vaccine the PCV13 and PCV23	90.3% (343)	89.6% (249)	92.2% (94)	0.451

PCV13 provides protection against 13 types of strains and is indicated for only >65 year age patients	40.5% (154)	37.1% (103)	50% (51)	0.023
PCV23 provides protection against 23 types of strains and indicated for all age groups	61.1% (232)	64.4% (179)	52% (53)	0.028
Influenza vaccine is indicated in all cardiac patients twice a year in end of the summer and before winter season	41.3% (157)	45.3% (126)	30.4% (31)	0.009
Pneumococcal PCV23 is indicated in all cardiac patients more than 65 years of age and those who are less than 65 years but have chronic kidney diseases (CKD), uncontrolled diabetes, cigarette smoker once in 5 year	81.6% (310)	79.1% (220)	88.2% (90)	0.043
Total Knowledge Score (0-100)	63.09 ± 13.61	62.2 ± 13.81	65.51 ± 12.81	0.035
General Feedback				
Reasons for not prescribing				
It is not indicated	36.7% (36)	39.2% (31)	26.3% (5)	0.055
No knowledge of it	8.2% (8)	7.6% (6)	10.5% (2)	0.877
It is costly	16.3% (16)	16.5% (13)	15.8% (3)	0.427
Not readily available	42.9% (42)	39.2% (31)	57.9% (11)	0.851
Other	5.1% (5)	5.1% (4)	5.3% (1)	0.708

Table 2: Knowledge score by various characteristics of the participants

Characteristics	Total (N)	Total Knowledge Score (0-100)	P-value
		Mean ± SD	
Gender			
Male	224	63.72 ± 14.22	0.279
Female	156	62.18 ± 12.67	
Age			
Up to 40 years	366	62.89 ± 13.62	0.154
More than 40 years	14	68.18 ± 12.73	
Area of work			
Public Sector	333	63.04 ± 13.71	0.848
Private Sector	47	63.44 ± 13.06	
Education Level			
Graduate	233	62.58 ± 13.53	0.365
Postgraduate trainee	147	63.88 ± 13.75	

DISCUSSION

A recent study enlightens the greater adherence of influenza vaccination of heart failure in respect to ACC/AHA heart failure quality measures among high-performing centres and suggested to promote high quality care the best practice is to adopt a structural intervention through a system level. They further suggest facilitating hospitalized patient's electronic or computerized reminders for influenza vaccination should be used. On top of that, the best exercise to improve vaccination rates among high-risk cardiovascular patients is to enhanced educational efforts, clinician and patient engagement, reductions in barriers, and novel strategies for improving access.⁷ In the light of all crucial findings to adopt a systematic approach to facilitate influenza and pneumonia vaccination among coronary artery disease patients, we design a cross-sectional multicenter study to evaluate and enhance the knowledge of cardiologists, internists, and Family physicians.

Targeted 470 health care practitioners from the age of 20 to 59 years, “Beliefs, attitudes, and activities of healthcare personnel about influenza and pneumococcal vaccines. Human Vaccines & Immunotherapeutic” were conducted.⁸ All health care practitioner was categorized into three main groups i.e. “the regularly vaccinated group, which consisted of HCP who had been vaccinated more than 3 consecutive times in the previous 5 years; the irregularly vaccinated group, which comprised those who had been vaccinated 1–3 times in the previous 5 years; and the never vaccinated whose constituent members had never been vaccinated”. According to the results 167 had “never vaccinated”. 182 were “vaccinated irregularly”, and 121 were “regularly vaccinated”. In this study Çiftci F et al.⁸, computed the reason for taking vaccination was to reduce the rates of severe conditions such as pneumonia, and death-43.2%, it reduced hospitalization-40.8%, the vaccine provided partial protection-75.2%, and it reduced workforce loss-48.8%. In addition to that, 81.6% taken the vaccination to protect family members from being infected, 47.2% vaccinated to protect her/himself, 51.2% to protect people around, and only 28% to protect patients. They concluded the main reason of health care practitioners to not recommend the influenza vaccine was due to fear of its acute adverse effects, doubts about its efficacy, and safety, and the lack of adequate knowledge about vaccination. Furthermore, besides the mentioned reasons of not recommending pneumococcal vaccination among 5.1% healthcare practitioner believes of its high price availability.

According to survey,⁶ last year the rates of vaccination were 4.5% for pneumococcal vaccination and 58% for influenza were observed in participating physicians. Only 70% of general physicians recommended

influenza-vaccination through their colleagues. Besides the knowledge level between practitioners and specialists was similar in influenza vaccination, however, lower statistical values were computed.^{6,8-10} furthermore, it was also observed that general practitioner believes *S. pneumoniae* disease was potentially severe, with high morbidity and mortality although on questioning this statement with proven invasive pneumococcal disease, they have hardly seen patients in their own practice. All general practitioners suggest the pneumococcal vaccination was the least important to recommend.¹⁰⁻¹² When ruling out the real cause of not recommendation was mainly of 03 reasons i.e., pneumococcal diseases were not considered an important problem in daily practice, other diseases, or problems, or even other vaccinations were more important and had to be solved or discussed first, and no patient has asked about the pneumococcal vaccination even they even know this vaccination exists. In their study, their general practitioner recommends a good vaccination campaign, a combination of the pneumococcal vaccination with the influenza vaccination campaign, to provide a free vaccination; and to sensitize society for the pneumococcal disease via TV commercials or on medical websites would be helpful to minimize the gap of the vaccination exercise.^{9,11,12}

CONCLUSION

In this survey, it was observed that most of the health care professionals participated were not thoroughly well-aware about indications of the vaccine in CVS patients. Additionally scope of the vaccine is under-estimated because of lack of knowledge regarding importance of vaccine in CVS patients and secondly due to unavailability of vaccine in most of the areas of Pakistan. There was limitation that most of the population of survey had less than 05 years of experience in dealing with CVS patients. Nevertheless, this survey has highlighted that we need to work on the education of our health care professionals to reap maximum benefits from the guidelines and recommendations.

AUTHORS' CONTRIBUTION:

NAS and TA: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. MFHT, SAS, RK, KIB, AS, STH: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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