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The Drivers And Barriers Of Adult Vaccination Among Healthcare Staff In A Tertiary Care Hospital In Northern India.

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ABSTRACT

Adult immunization is an important aspect of preventive health services aimed at reducing morbidity and mortality against vaccine preventable diseases. The primary objective in our study was to determine the knowledge, attitude, and recommendation practices (KAP) of hospital staff regarding adult vaccinations. The secondary objective was to identify the perceived barriers to vaccine hesitancy in practice. A cross-sectional study was conducted in a 250 bedded hospital from January to February 2024. All hospital staff such as doctors, nurses, technical, and support staff were included in the study. A pre-validated questionnaire was physically administered to all hospital staff who volunteered to participate in the study. Doctors (77%) answered a greater number of knowledge-based questions correctly than nurses (68.5%) and other staff (60.3%). Other staff (63.6%) showed a more positive attitude for receiving training and counselling for adult vaccination than doctors (45.5%) and nurses (49.1%). All doctors (100%) deem it necessary to recommend adult vaccines to patients. Lack of sufficient knowledge was the most common barrier to vaccine hesitancy (94.6%) in our study. There is a dire need for augmentation of adult immunization training programs amongst hospital staff. Interventions aimed at improving the KAP should be encouraged, and their impact on vaccine coverage should be assessed.

Keywords: Adult vaccination, attitude, healthcare workers, knowledge, recommendation practice, vaccines

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INTRODUCTION

Adult immunization is an important aspect of preventive health services aimed to reduce morbidity and mortality against vaccine preventable diseases (VPD). Childhood immunization practices are well established in most countries but, coverage rates for routine adult vaccinations remains relatively low [1-3].

Despite the vaccine guidance provided by the national and state level organizations, healthcare worker (HCW) recommendations are highly influenced by one's own knowledge, attitude, and practices (KAP). HCWs with positive attitudes towards the vaccine's safety, efficacy, and efficiency are more likely to deliver stronger vaccine recommendations [4,5]. Of late, vaccine hesitancy amongst HCWs has been identified as a key barrier in optimizing vaccine uptake, and has been listed amongst the top ten global threats to public health by the World Health Organization (WHO) [6,7]. WHO recommends adult vaccination against hepatitis B, polio, measles, rubella, meningococcus, influenza, varicella, and diphtheria for HCWs [8]. In addition, the Indian Biomedical Waste (BMW) Management Rules, 2016 also recommend tetanus vaccination for any HCW involved in the handling of BMW [9].

Some studies have reported a heightened response and greater engagement with vaccination post the COVID-19 pandemic [1]. A positive vaccine attitude and high vaccine knowledge amongst HCWs are significantly associated with routine vaccine recommendations to all the eligible patients [4]. A low perception of disease risk and limited knowledge regarding disease severity, safety and efficacy of vaccines are the drivers of vaccine hesitancy and barriers to preventive health services. Persistence of vaccine misconceptions can negatively impact vaccine confidence and vaccine communication of HCWs with their patients and families.

Hospital staff are at a greater risk of acquiring vaccine preventable diseases than the general population. This is due to higher number of infections in the healthcare setup, increased exposure to contagious pathogens, and patients with high risk of complications. Assessing the knowledge and attitude towards adult vaccinations in general will also help us to assess the baseline levels of awareness amongst healthcare workers before designing and implementing educational or interventional programs in the population of interest. Based on the study results, focussed interventions can be included to promote vaccination for disease prevention such as increasing awareness of evidence-based strategies to facilitate immunization and periodic training sessions to reduce vaccine misconceptions and hesitancy.

KAP studies involving adult vaccination has been an under researched topic especially among the HCWs. Only a few studies have been published and even those have evaluated knowledge of specific vaccines amongst the general public. In view of the above, this prospective cross-sectional study was conducted with the primary objective of determining the knowledge, attitude, and recommendation practices of hospital staff regarding adult vaccinations in a tertiary care hospital. The secondary objective was to identify the perceived barriers to vaccine hesitancy in practice.

MATERIALS AND METHODS

Study design and participants

A prospective cross-sectional study was conducted in a 250 bedded tertiary care hospital in northern India from January 2024 to February 2024. It was open to all hospital staff including doctors, nurses, technicians, and support staff.

Questionnaire development

A 22-item survey was conducted in the form of a pre- validated questionnaire with the first section on socio-demographic information, and subsequent sections on knowledge and attitude towards adult vaccination. It comprised of nineteen closed ended and three open ended questions. Doctors were given 5 additional questions based on recommendation practices comprising of four open ended and one closed ended question. Informed consent was taken from the participants and questionnaire was filled without any linked identifiers. A total of 205 subjects participated in the study. Information was collected on the following themes: knowledge of vaccine recommendations, vaccination schedule, vaccine preventable

diseases, vaccines contraindicated in pregnancy, travel related vaccines, and attitude towards adult vaccines.

Data analysis

The questionnaire was developed on the basis of previous survey-based studies in literature. Collected data was entered in the MS Excel. Categorical data was presented as percentage (%). Chi square test was used to evaluate differences between groups for categorized variables. A *p*-value of <0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

Table 1: Showing socio-demographic and professional characteristics of participants

Characteristics	Total (N= 205)
Age (in years)	
18-20	10 (4.8%)
21-30	97 (47.3%)
31-40	80 (39.02%)
41-50	15 (7.3%)
51-60	3 (1.4%)
Gender	
Male	102 (49.7%)
Female	103 (50.2%)
Residential area	
Urban	152 (74.1%)
Rural	22 (10.7%)
Suburban	31 (15.1%)
Marital status	
Married	127 (61.9%)
Unmarried	78 (38.04%)
Profession	
Doctor	29 (14.1%)
Nurse	35 (17%)
Technician	42 (20.5%)
Administrator	20 (9.8%)
Support service provider (housekeeping, sanitation)	79 (%)
Healthcare experience (in years)	
<5	113 (55.1%)
5-10	57 (27.8%)
>10	35 (17.07%)
Area of practice	
Laboratory services	44 (21.4%)
Cardiology/ catheterization laboratory	29 (14.1%)
Nephrology/ dialysis	17 (8.2%)
Gastroenterology	10 (4.8%)
Neurology	15 (7.3%)
Nuclear Medicine	4 (1.9%)
Emergency services	5 (2.4%)
Housekeeping	38 (18.5%)
Support services/ administration	43 (20.9%)
Highest level of education	
Less than high school	19 (9.2%)
High school	54 (26.3%)
Graduate	98 (47.8%)
Post graduate	34 (16.5%)

Subjects were categorized as doctors in the first category, nurses in the second category, and all others in the third category. Table 1 shows the socio-demographic and professional characteristics of participating staff. Most of them were in the age group 21-30 years (47.3%), females (50.2%), living in

urban areas (74.1%), married (61.9%), graduate (47.8%), and had <5 years of experience (55.1%). Doctors comprised of 14.1%, nurses 17.07%, and others 68.7% of the study subjects.

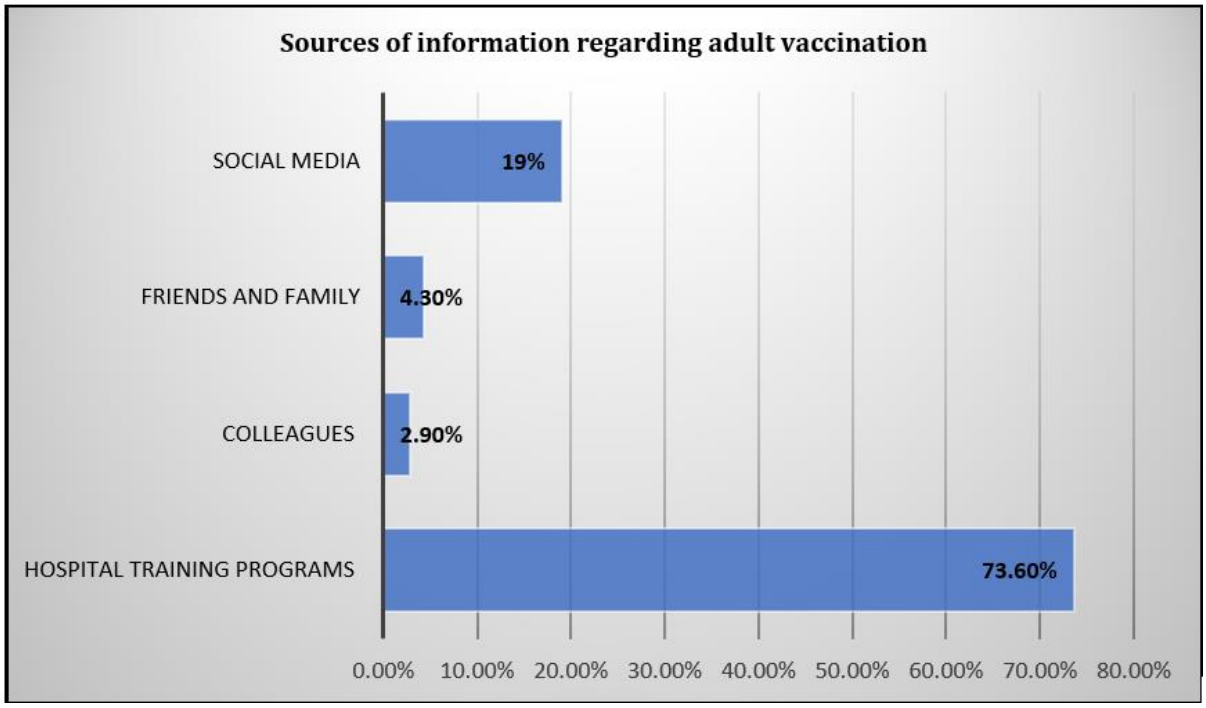
Infectious diseases continue to be a cause of concern for HCWs with vaccines as one of the most cost-effective preventive strategies. Adult vaccination acts as a booster for childhood vaccines, and can prevent life threatening infections especially amongst the high-risk groups such as HCWs. They also contribute to decrease in disease transmission, and prevent individuals from cutting down on their active life years [10].

Knowledge pertaining to adult vaccination

Sources of knowledge

Hospital training programs (73.6%) were the most common source of knowledge followed by social media (19%) as shown in Figure 1. Sengchaleun V et al also observed hospital training programs (89.7%) as most common source in their study [11]. The rising trend of acquiring healthcare related information from social media sites is of utmost concern [12, 13]. The COVID-19 pandemic was first of its kind with constant media coverage and bombardment of misinformation from unreliable sources. Misinformation aggravates the emotional turmoil of HCWs, and is heightened by confusion and conspiracy theories [14].

Figure 1: Showing sources of information of hospital staff regarding adult vaccination



Knowledge assessment

Table 2 shows that doctors and nurses were significantly more aware regarding VPDs than others (p<0.05). About 74% of the subjects correctly responded about VPD eliminated from India. Only 62% were aware of the essential vaccines in case of an outbreak (p>0.05). Knowledge regarding travel related vaccines was only present in 39.5% of the participants (p>0.05). Awareness regarding vaccines contraindicated in pregnancy was statistically significant (p<0.05), and present in 41.4% of the subjects who were mostly doctors (79.3%). Subjects showed maximum awareness regarding tetanus vaccination for BMW related injuries (91.7%).

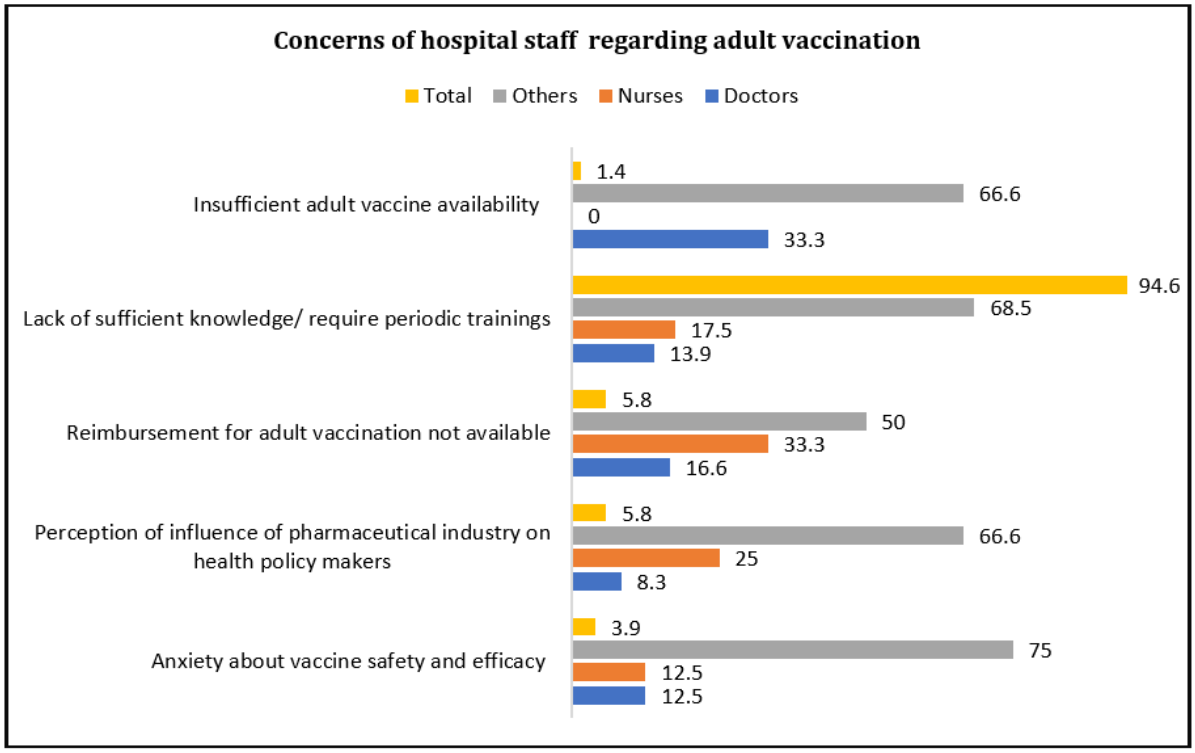
Knowledge regarding Hepatitis B was present in 70.4% subjects and was statistically significant (p<0.05) for both aetiology and recommended schedule for its vaccination. Doctors gave maximum correct answers followed by nurses and others. Similar results have been reported in other studies [11, 15].

Overall, doctors (77%) answered a greater number of knowledge-based questions correctly than nurses (68.5%) and other staff (60.3%). Similar results have also been reported in other studies [16, 17]. Based on Table 2 areas with least knowledge are travel related vaccines and vaccines contraindicated in pregnancy, which need to be the focus of future training programs.

Concerns regarding adult vaccination

Figure 2 shows that barriers to adult vaccinations are variable among different strata of hospital staff, with lack of sufficient knowledge being the most common (94.6%). Subjects feel that they are unaware of the latest guidelines, and require periodic trainings for the same. Lack of sufficient knowledge has previously been identified as a deterrent to adult vaccination in other studies as well [16, 18-19].

Figure 2: Showing concerns of hospital staff regarding adult vaccination (in %)



However, anxiety about vaccine safety and efficacy was the most common concern amongst the third category (75%). Other areas of concern for the third category are reimbursement for adult vaccination not available (5.8%), and perception of influence of pharmaceutical industry on health policy makers (5.8%). MacDougall DM et al also stated in their study that HCWs do not trust recommendations from pharmaceutical companies, and are skeptical about vaccine safety and efficacy [16].

In our study, doctors are predominantly concerned about insufficient adult vaccine availability (33.3%) especially human papilloma virus (HPV) vaccine, while nurses for reimbursement (33.3%). Cost has been identified as a barrier in numerous studies with increased likelihood of getting vaccinated if adult vaccines are available for free or at minimal cost [16, 20-22]. The availability of adult vaccines in itself is a challenge such as travel related vaccines which are available only at a handful of government centers. The government of India has included HPV vaccination in universal immunization program (UIP) for adolescents 9-14 years of age. Recently, Serum Institute of India Private Limited. has rolled out an indigenous HPV vaccine (CERVAVAC®) which is a recombinant quadrivalent vaccine targeting serotypes 6, 11, 16, and 18 [23].

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Attitude for adult vaccination

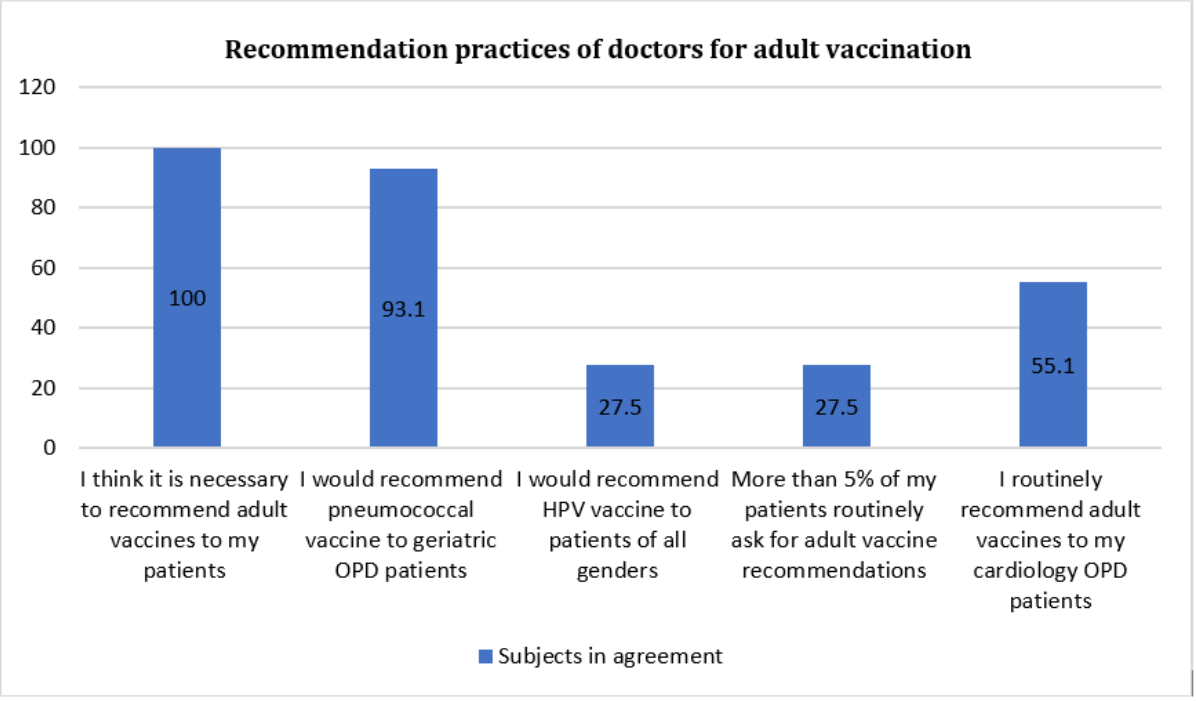
Table 2: Showing aggregate hospital staff responses to questions assessing adult vaccine knowledge and attitude

Adult vaccines knowledge assessment	Correctly answered (N=205)	Answered	Doctors (N= 29)	Nurses (N= 35)	Others (N= 141)	*p*-value
Vaccine preventable diseases (VPD)	106 (51.7%)	Correct	20	21	65	0.045077
		Incorrect	9	14	76	
Aetiology of Hepatitis-B	127 (61.9%)	Correct	26	28	73	0.000036
		Incorrect	3	7	68	
VPD eliminated from India	152 (74.1%)	Correct	24	25	103	0.510328
		Incorrect	5	10	38	
Essential vaccines in cases of outbreak	127 (61.9%)	Correct	20	18	89	0.311736
		Incorrect	9	17	52	
Contraindications for receiving COVID-19 vaccine	156 (76.09%)	Correct	21	26	109	0.821793
		Incorrect	8	9	32	
Recommended schedule for Hepatitis-B vaccine	162 (79.02%)	Correct	28	34	100	0.00013
		Incorrect	1	1	41	
Recommended vaccines for travel to Africa	81 (39.5%)	Correct	11	12	58	0.746142
		Incorrect	18	23	83	
Vaccines contraindicated in pregnancy	85 (41.4%)	Correct	23	20	42	0.00001
		Incorrect	6	15	99	
Tetanus vaccine for BMW related injuries	188 (91.7%)	Correct	28	32	127	0.531632
		Incorrect	1	3	14	
Adult vaccine attitudes assessment	**Subjects in agreement (N=205)**	**Agreement**	**Doctors (N= 29)**	**Nurses (N= 35)**	**Others (N= 141)**	***p*-value**
I would take meningococcal vaccine before going for mass gatherings (such as Hajj)	177 (86.3%)	Agree	25	29	123	0.796119
		Disagree	4	6	18	
I routinely take annual influenza vaccine	71 (34.6%)	Agree	13	14	44	0.285326
		Disagree	16	21	97	
COVID-19 pandemic has heightened my awareness towards vaccination in general	151 (73.6%)	Agree	19	25	107	0.486488
		Disagree	10	10	34	
I require training and counselling for becoming up to date with the national recommendations for adult vaccinations	116 (56.5%)	Agree	7	13	96	<0.00001
		Disagree	22	22	45	
I would like to gain knowledge on HPV vaccination	86 (41.9%)	Agree	2	5	79	<0.00001
		Disagree	27	30	62	

Figure 3 shows that all doctors (100%) deem it necessary to recommend adult vaccines to patients. In certain studies, many participants were of the view that all relevant vaccines were administered in childhood, and had low awareness of adult vaccines [16]. Receiving training and counselling for adult vaccine recommendations was significantly associated with a positive attitude (Table 2, $p<0.00001$). Overall, the third category (63.6%) showed a more positive attitude towards adult vaccination than doctors

(45.5%) and nurses (49.1%). Hiba J. Barqawi et al showed a more positive attitude of doctors in their study [12].

Figure 3: Showing recommendation practices of doctors for adult vaccination (in %)



The Saudi government recommends quadrivalent meningococcal vaccine at least 10 days before taking the Hajj pilgrimage [24]. About 86% of the subjects would take meningococcal vaccine before going for mass gatherings such as Hajj in our study. Having said that, one should remember that there is a common tendency of respondents to provide answers that are considered as socially acceptable responses [25, 26]. Only 34.6% of the subjects responded that they routinely take annual influenza vaccine. With the advent of COVID-19 pandemic, everyone seems to have forgotten about the dreadful influenza pandemics. However, rising influenza cases in flu outpatient departments (OPD) are a matter of concern especially today when only a margin of HCWs are sensitized to take its vaccine [27].

It is an acceptable fact that HCWs possess higher levels of knowledge and awareness about the risk of disease transmission from themselves to their family members and patients. Knowledge regarding contraindications for COVID-19 vaccine was present in 79.02% of the subjects ($p>0.05$). However, there is a great degree of variability to determine their primary motivation for getting vaccinated [28-31]. In our study, 65.3% of the subjects responded that they took COVID-19 vaccine for self-protection, followed by social responsibility (21.9%), protection of family (8.2%), and protection of patients (2.4%). About 2% of the participants did not take even a single dose of the vaccine. Vaccine hesitancy has also been explored in various studies [1, 4]. Even though the pandemic caused widespread chaos and exhaustion, it did have a silver lining. About 74% subjects responded that their knowledge about vaccines has increased post the COVID-19 pandemic [1]. Another study also showed that post pandemic, the knowledge of infectious diseases has increased amongst the HCWs and the general population including vaccine preventable diseases [32].

Only 5.36% of the subjects were completely vaccinated against HPV during the study period. Table 2 shows that gaining knowledge on HPV vaccination was significantly associated with a positive attitude ($p<0.00001$). Our study showed that only 27.5% doctors would recommend HPV in all genders. Lack of knowledge and awareness regarding HPV vaccine is present in all strata of population with most believing that it is only relevant for females. There is also a taboo associated with the sexually transmitted infections with concerns that if one is taking this vaccine that means the person has either multiple sexual partners, indulges in unsafe sexual practices, or is homosexual. January is celebrated as cervical cancer awareness month around the world.

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Recommendation practices of doctors for adult vaccination

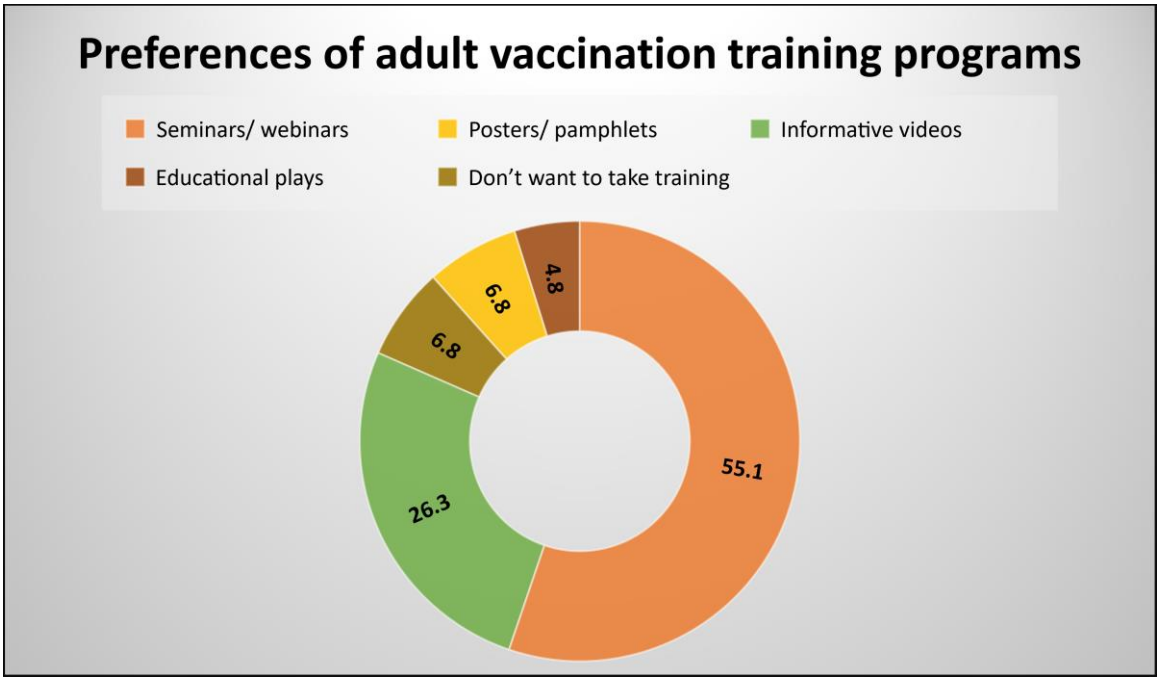
About 93% doctors would recommend pneumococcal vaccine to geriatric patients (>60 years) while only 55.1% would routinely recommend adult vaccines to cardiology patients (Figure 3). The Centre for Disease Control and Prevention (CDC) recommends Influenza, Pneumococcal, Shingles, TdaP (Tetanus toxoid, adult dose of diphtheria, and acellular pertussis), COVID-19 vaccines in cardiac patients [33]. Only 27.5% of doctors responded that more than 5% of their patients routinely ask for adult vaccine recommendations. This is due to lack of awareness in general population regarding adult vaccines as shown in various studies [10, 16]. There is usually a polarity in responses of the hospital staff with some preferring individual assessment of disease risk and need, while others emphasizing greater good of the society. A certain study reported that 92% of the HCWs considered pneumococcal, influenza, and shingles vaccine as essential for the health of adults, while only 56.3% felt that about pertussis [16].

Despite the widespread and growing impact of social media for providing healthcare associated information, it is essential that the general population consider HCWs as the most accurate source of knowledge for vaccination [12, 25]. Recommendation practices of HCWs are the key to final decision of the general public for getting vaccinated [34-39]. Various studies have shown that missed opportunities for adult vaccination are due to lack of motivation by the attending physicians [40, 41].

Preferences of hospital staff regarding adult vaccination training programs

Periodic training sessions with pre- and post-class assessments are essential to ensure percolation of knowledge and awareness amongst various strata of HCWs. About 55% subjects would prefer seminars or webinars for training, while 26.3% preferred informative videos which they can access as per their time and need (Figure 4). Few staff preferred posters (6.8%) and educational plays (4.8%) as well. However, around 7% of the subjects were not interested in talking any type of training due to reasons as such lack of time, increased workload, and reduced relevance to their area of expertise as they worked in non-clinical or administrative departments. It is crucial to focus on such type of groups to make them realise the importance of vaccination in a healthcare set up irrespective of the department, and also to counsel them for awareness and inculcate a positive attitude.

Figure 4: Showing preferences of hospital staff regarding adult vaccination training programs (in %)



For adult vaccinations, achieving the same level of success as childhood vaccinations is a distant dream. CDC has quality improvement projects which target immunization, and aim to improve adult vaccination rates through reminder and recall systems. Although these associations focus on the American

population as of now, but they can be used globally for guiding the country specific schedules for empowering and encouraging HCWs [12].

While most of the studies pertaining to adult vaccination focus only on doctors, inclusion of administrators and other support services staff is a novel approach explored in our study. Though not directly involved in patient care, support staff have a strong impact on the society as they are usually better updated on vaccines than most people working in other industries leading to an indirect influence on dissemination of healthcare associated information. Also, they are prone to numerous infections from the hospital environment which makes it essential to provide periodic trainings on this stratum of hospital workers.

CONCLUSION

Though there is much impetus on childhood vaccination, the government has not yet focused on adult immunization completely. Decision to include adult vaccination in the national immunization schedule would require some cost-benefit analysis studies. However, incorporating a system of reminder and recall may have a role in increasing adult vaccine uptake. As the burden of VPD shifts to older individuals, protecting adults against these infections is part of an effective strategy for improving quality of life, and curbing morbidity and mortality particularly in this age group. Establishment of dedicated adult vaccination centres, and periodic trainings regarding VPDs can help in increasing acceptance of adult vaccination amongst HCWs. Incorporation of both the HCWs and regulatory bodies is essential to facilitate effective adult immunization behaviours. Assessment of impact of training programs on adult vaccine coverage amongst the hospital staff can be the focus of future studies.

Limitations

A common questionnaire for all strata of hospital staff could be a possible limitation of the study. Other limitations include single centre sample, voluntary nature of participation, and change of attitude and practice over time which cannot be established due to cross-sectional nature of the study.

REFERENCES

[1] Redondo Margüello E, Trilla A, Munguira IL, López-Herce AJ, Cotarelo Suárez M. Knowledge, attitudes, beliefs and barriers of healthcare professionals and adults ≥ 65 years about vaccine-preventable diseases in Spain: The ADult Vaccination drivers and barriers (ADVISE) study. Hum Vaccin Immunother 2022; 18(1): 2025007.

[2] Williams WW, Lu P, O'Halloran A, Kim DK, Grohskopf LA, Pilishvili T, et al. Surveillance of vaccination coverage among adult populations — United States, 2015. MMWR Surveill Summ 2017; 66 (No. SS– 11):1–28.

[3] Hunter P, Fryhofer SA, Szilagyi PG. Vaccination of adults in general medical practice. Mayo Clin Proc 2020; 95(1):169–83.

[4] Fernandes A, Wang D, Domachowske JB, Suryadevara M. Vaccine knowledge, attitudes, and recommendation practices among health care providers in New York State. Hum Vaccin Immunother 2023(1); 19:2173914.

[5] Lin C, Mullen J, Smith D, Kotarba M, Kaplan SJ, Tu P. Healthcare providers' vaccine perceptions, hesitancy, and recommendation to patients: a systematic review. Vaccine 2021; 9(7):713.

[6] MacDonald NE, SAGE Working Group on Vaccine Hesitancy. Vaccine hesitancy: definition, scope, and determinants. Vaccines 2015; 33(34):4161–4.

[7] World Health Organization. Ten health issues WHO will tackle this year. World Health Organization. Available from: www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019, accessed on February 10, 2024.

[8] World Health Organization. Summary of WHO position papers immunization of health care workers. Available from: http://www.who.int/publications/m/item/table4-who-recommendations-for-routine-immunization, accessed on February 12, 2024.

[9] National Health Mission. Ministry of Environment, Forest & Climate Change, Government of India. Guidelines for management of Healthcare Waste as per Biomedical Waste Management Rules, 2016. Available from: https://cpcb.nic.in/uploads/Projects/Bio-Medical Waste/Guidelines_healthcare_June_2018.pdf, accessed on February 20, 2024.

[10] Sashindran VK, Mohakuda SS, Murari T, Setlur R, Bansal V, Devdas N. A Study on Knowledge Attitude and Practices of Adult Vaccination in Western India. J Vaccines Res Vaccin 2020; 6:11.
[11] Sengchaleun V, Khampanisong P, Aye-Soukhathammavong P, Reinharz D, Black AP. Knowledge, attitudes and practices regarding vaccination among healthcare workers in Lao PDR. Southeast Asian J Trop Med Public Health 2019; 50(2):383-91.
[12] Barqawi HJ, Samara KA, Hassan MS, Amawi FB. Adult Vaccination in the United Arab Emirates—A Physicians' Knowledge and Knowledge Sources Study. Front Public Health 2022; 10:865759.
[13] Karafillakis E, Larson HJ. The benefit of the doubt or doubts over benefits? A systematic literature review of perceived risks of vaccines in European populations. Vaccine 2017; 35:4840–50.
[14] Nelson T, Kagan N, Critchlow C, Hillard A, Hsu A. The Danger of Misinformation in the COVID-19 Crisis. Mo Med 2020; 117(6): 510-12.
[15] Hadaye RS, Shastri S, Lavangare SR. A cross-sectional study to assess the awareness and practices related to adult immunization among nursing students in a metropolitan city. J Educ Health Promot 2018;7.
[16] MacDougall DM, Halperin BA, MacKinnon-Cameron D, Li L, McNeil SA, Langley JM, et al. The challenge of vaccinating adults: attitudes and beliefs of the Canadian public and healthcare providers. BMJ Open 2015; 5: e009062.
[17] Riccio M, Marte M, Imeshtari V, Vezza F, Barletta VI, Shaholli D, et al. Analysis of Knowledge, Attitudes and Behaviours of Health Care Workers towards Vaccine-Preventable Diseases and Recommended Vaccinations: An Observational Study in a Teaching Hospital. Vaccines 2023; 11(1):196.
[18] Johnson DR, Nichol KL, Lipczynski K. Barriers to adult immunization. Am J Med 2008;121(7 Suppl 2): S28–35.
[19] National Foundation for Infectious Diseases. National survey on adult vaccination reports low consumer awareness of vaccines and the risks of vaccine preventable diseases. Bethesda, MD: National Foundation for Infectious Diseases, 2008.
[20] Fowles JB, Beebe TJ. Failure to immunize the elderly: a systems problem or a statement of personal values? Jt Comm J Qual Improv 1998; 24:704–10.
[21] Mortensen GL. Perceptions of herpes zoster and attitudes towards zoster vaccination among 50–65-year-old Danes. Dan Med Bull 2011; 58: A4345
[22] Cameron KA, Rintamaki LS, Kamanda-Kosseh M, Noskin GA, Baker DW, Makoul G, et al. Using theoretical constructs to identify key issues for targeted message design: African American seniors' perceptions about influenza and influenza vaccination. Health Commun 2009; 24:316–26.
[23] Anonna Dutt. Govt push to HPV shot for girls in 9-14 yrs age group [internet]. New Delhi. Available from: https://indianexpress.com/article/india/govt-push-to-hpv-shot-for-girls-in-9-14-yrs-age-group-9139416/, accessed on March 1, 2024.
[24] Alasmari A, Houghton J, Greenwood B, Heymann D, Edwards P, Larson H, et al. Meningococcal carriage among Hajj pilgrims, risk factors for carriage and records of vaccination: a study of pilgrims to Mecca. Trop Med Int Health 2021; 26(4):453-461.
[25] Herzog R, Álvarez-Pasquin MJ, Díaz C, Del Barrio JL, Estrada JM, Gil Á. Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? A systematic review. BMC Public Health 2013; 13:1-7.
[26] Yu IT, Tse SL. Workshop 6-sources of bias in cross-sectional studies; summary on sources of bias for different study designs. Hong Kong Med J 2012, 18: 226–7.
[27] Flu cases continue to rise, doctors advise caution [internet]. Chennai. Available from: https://timesofindia.indiatimes.com/city/chennai/flu-cases-continue-to-rise-doctors-advise-caution/articleshow/107674971.cms, accessed on March 4, 2024.
[28] Davis MM, Kretsinger K, Cowan AE, Stokley S, Clark SJ: New combined tetanus-diphtheria-acellular pertussis vaccines for adults: primary care physician attitudes and preferences. Hum Vaccin 2007; 3:130–4.
[29] Gust D, Weber D, Weintraub E, Kennedy A, Soud F, Burns A: Physicians who do and do not recommend children get all vaccinations. J Health Commun 2008; 13:573–582.
[30] Goodyear-Smith F, Grant C, Petoussis-Harris H, Turner N: Immunization champions: characteristics of general practitioners associated with better immunization delivery. Hum Vaccin 2009; 5:403–11.
[31] Salmon DA, Pan WK, Omer SB, Navar AM, Orenstein W, Marcuse EK, et al: Vaccine knowledge and practices of primary care providers of exempt vs. vaccinated children. Hum Vaccin 2008; 4:286–91.

[32] Seung-Pyo Jun, Hyoung Sun Yoo, Jae-Seong Lee. The impact of the pandemic declaration on public awareness and behavior: Focusing on COVID-19 google searches. Technol Forecast Soc Change 2021; 166: 120592.
[33] Centre for Disease Control and Prevention. Flu & People with Heart Disease or History of Stroke. Available from: https://www.cdc.gov/flu/highrisk/heartdisease.htm, accessed on March 10, 2024
[34] European Vaccine Manufacturers. Survey regarding the Perception of Vaccines and Vaccinations. International Summary Report 2004. Available from: http://www. webcitation.org/query.php?url=http://www.evm-vaccines.org/pdfs/ survey_perceptions.pdf, accessed March 14, 2024.
[35] Navarro JA, Bernal PJ, Niguez JC. Analysis of factors influencing vaccine uptake:perspective from Spain. Vaccine 2001; 20(Suppl 1):13–15.
[36] Bovier PA, Chamot E, Bouvier M, Loutan L. Importance of patients' perceptions and general practitioners' recommendations in understanding missed opportunities for immunisations in Swiss adults. Vaccine 2001; 19:4760–7.
[37] Centers for Disease Control and Prevention. Adult immunization: knowledge, attitudes and practices, DeKalb and Fulton Counties, Georgia, 1988. MMWR Morb Mortal Wkly Rep 1988; 37:657–61.
[38] Gellin BG, Maibach EW, Marcuse EK. Do parents understand immunizations? A national telephone survey. Pediatrics 2000; 106:1097–1102.
[39] Stefanoff P, Mamelund SE, Robinson M, Netterlid E, Tuells J, Bergsaker MA, et al. Tracking parental attitudes on vaccination across European countries: The Vaccine Safety, Attitudes, Training and Communication Project (VACSATC). Vaccine 2010; 28:5731–7.
[40] Baykan Z, Naçar M, Özdemir SB, Poyrazoğlu S, Çetinkaya F. Knowledge and attitude of family physicians regarding adult vaccination. World J Vaccines 2011; 1(3):92-7.
[41] PA Bovier, E Chamot and GM Bouvier. Importance of Patients' Perceptions and General Practitioners' Recommendations in Understanding Missed Opportunities for Immunisations in Swiss Adults. Vaccine 2001; 4760-7.