



# Herpes Zoster Vaccine Awareness and Acceptance among General Population in Northern Border Region: A Cross-Sectional Study

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**Abstract Objectives:** Herpes Zoster (HZ) is a significant health concern caused by reactivation of latent varicella-zoster virus, particularly among older adults and individuals with chronic comorbidities. Despite the availability of an effective Recombinant Zoster Vaccine (RZV), uptake remains low in Northern Border Region in Saudi Arabia. To assess Knowledge, Attitudes and Practices (KAP) regarding HZ and its vaccination among the general population in Northern Border Region in Saudi Arabia. **Method:** A cross-sectional descriptive survey was conducted among population residing Northern Border region of Saudi Arabia. A self-administered questionnaire assessed demographic characteristics, knowledge of HZ, attitudes toward vaccination and vaccination practices. Data were analyzed descriptively and inferentially. **Results:** A total of 708 participants were included. Overall knowledge of HZ was low among 63.7% of respondents. Only 42.8% knew that the vaccine is offered free by the Ministry of Health. Positive attitude was detected in 60.7% of the participants, whereas 39.3% had a negative attitude. Only 10.0% had good practice regarding the shingles vaccine, while 90.0% had poor practice. Age was a significant predictor, with participants aged 30-39 years (OR = 2.718, 95% CI: 1.462–5.055, p = 0.002) being more likely to have information about the HZ vaccine compared to those aged 50 years or older. Gender was a significant factor (p = 0.008), with females (65.8%) showing a higher percentage of positive attitudes compared to males. Participants aged 18-29 were more than twice as likely (OR = 2.75, 95% CI: 1.30-5.82, p = 0.008) to have a positive attitude compared with those aged ≥50. **Conclusion:** Despite the significant burden of HZ in Saudi Arabia, awareness and vaccination uptake remain inadequate. Strengthening public education, enhancing healthcare provider engagement and integrating vaccination into routine clinical pathways are essential to improving coverage and reducing HZ-related morbidity in the Kingdom.

**Key Words** Herpes Zoster, Shingles Vaccine, Recombinant Zoster Vaccine, Varicella, RZV, KAP Study, Northern Border Region, Saudi Arabia

## INTRODUCTION

The Varicella-Zoster Virus (VZV) is one of the human herpes viruses that cause both varicella (chickenpox) and Herpes Zoster (HZ) [1,2]. Varicella is characterized by a widespread, itchy rash that progresses rapidly from macules to papules, then to vesicles and finally to crusts. The dispersed and solitary lesions indicate viral dissemination to the skin. Varicella is typically mild in children in good health [3,4]. Acute viraemia causes varicella, whereas herpes zoster develops when a dormant viral infection of the cranial nerve or sensory root ganglia is reactivated [5,6]. The disease then spreads orthodromically from the ganglion to the

innervated target tissue (skin, cornea, auditory canal, etc.), although two or three nearby dermatomes may also be affected; typically, only one dermatome is affected [7]. Factors that impact the host immune system, such as old age, autoimmune illnesses, cellular immunological dysfunction and those who have undergone chemotherapy or steroids, influence the occurrence of HZ [8]. Actually, compared to immunocompetent people, these patients have a 20-100 times higher risk of HZ. [9]. Even experienced doctors may find it difficult to diagnose herpes zoster when it presents with unusual clinical features such as glioma, zoster sine herpette, or bilateral herpes zoster [8].

Varicella poses both nosocomial and occupational risks [7]. Patients with varicella are considered contagious from one to two days before the rash appears until all lesions have crusted, usually four to seven days after the rash appears [10]. Herpes Zoster (HZ), commonly known as shingles, results from the reactivation of latent VZV within dorsal root or cranial nerve ganglia [11]. Reactivation leads to a painful vesicular eruption and can result in complications such as post-herpetic neuralgia (PHN), neurological involvement and disseminated disease [12]. The global burden of HZ is increasing due to ageing populations and rising prevalence of chronic comorbidities [13]. Each year in the United States, about one million cases of HZ are reported, with over half occurring in individuals over 60 years. It is estimated that 1 in 3 individuals who have had a VZV infection will experience HZ in their lifetime [4].

In Saudi Arabia, recent data highlight a notable burden of HZ [14]. A multicenter analysis conducted between 2017 and 2022 across National Guard hospitals identified 1,019 confirmed cases, characterized by high rates of comorbidities and complications. Approximately one-third of patients experienced complications and more than 12% required hospitalization [15]. Despite these burdens, awareness remains low; a study from Jazan reported poor knowledge of HZ and low vaccine uptake among adults aged 50 years and above [16].

Two vaccines are available to prevent herpes zoster: the live vaccine, administered as a single dose and the non-live Recombinant Vaccine (RZV) [17]. Clinical trials indicate that the recombinant vaccine is 90 to 97% effective, whereas the live zoster vaccine is 50 to 70% effective [17]. The burden of illness from herpes zoster in older individuals will decrease with increased vaccination uptake and prophylactic interventions [18]. It is recommended for people aged 50 years and above and for optimal protection, a two-dose schedule is suggested [19]. Those aged 50 years or older in Saudi Arabia are eligible for this vaccination at no cost. Current vaccines effectively reduce the incidence, severity and consequences of HZ, including post-herpetic neuralgia [20]. Although these vaccines are available, vaccination uptake rates vary widely across different groups and geographical areas. Numerous factors, including socio-demographic characteristics such as age, gender, income, education level and access to healthcare services, have been found to affect vaccine uptake. Acceptance of vaccines may also be influenced by cultural and religious beliefs [21].

Understanding the current level of public knowledge, attitudes and practices regarding HZ vaccine is essential to guide evidence-based public health strategies and improve preventive care. This study aims to assess KAP regarding HZ vaccination among the general population in the Northern border region of Saudi Arabia.

## METHODS

### Study Design and Participants

A descriptive cross-sectional study was conducted in the Northern Border Region of Saudi Arabia from February to December 2025. Participants were recruited through online

platforms and public settings using convenience sampling. Adults aged 18 or above, both male and female, who lived in the Northern Border Region of Saudi Arabia and provided informed consent were targeted.

### Study Sample Size

The minimum required sample size was calculated using Daniel's formula:  $n = (Z^2 \times p \times (1 - p)) / d^2$ , where  $Z = 1.96$  for a 95% confidence interval,  $p =$  expected prevalence (0.5) and  $d =$  margin of error (0.05). Accordingly, the estimated sample size was 385 participants. The adjusted sample size was 462 participants, allowing for a potential 20% non-response rate.

In the current study, the target population's expected prevalence of Herpes zoster vaccination awareness and acceptability was considered when calculating the sample size, along with the desired confidence level and margin of error. A total of 708 fully completed questionnaires were collected.

### Data Collection

Data was collected anonymously through an online self-administered pre-validated questionnaire survey [21,22]. The questionnaire was created using Google Forms and disseminated electronically via social media platforms (WhatsApp, Twitter) in Arabic. Participation was voluntary and informed consent was obtained electronically. Participants were provided with the objectives and significance of the study. Two experts from the microbiology department validated the questionnaire. Minor modifications were made regarding the regional culture. 20 adults from the target study participants were used as a pilot sample to assess the questionnaire. Internal consistency for the multi-item domains assessing participants' awareness, knowledge, attitudes and practice toward the herpes zoster (shingles) vaccine was evaluated in the full study sample, yielding a Cronbach's alpha value of 0.531, which reflects moderate but suboptimal internal reliability, as values  $\geq 0.70$  are generally considered acceptable.

It consisted of six sections: (i) Demographic Information (7 questions), including age, sex, residence, marital status, educational level, occupation and nationality. (ii) Clinical status of study participants (3 questions) regarding history of chronic diseases, chicken pox and herpes zoster. (iii) General knowledge and awareness about HZ vaccination (9 questions), including information about the vaccine, incidence rate, availability in Saudi Arabia, contact with a diseased person and the target population for vaccination. (iv) Attitudes of HZ disease (11 questions) answered with yes or no regarding the effectiveness, presence of side effects and number of effective doses of the vaccine. (v) Practice about shingles vaccine (4 questions) regarding getting the vaccine before, contraindications, complications, minimal effectiveness of vaccine (vi) Source of information (one question).

### Data Analysis

Descriptive statistics summarized demographic characteristics and KAP outcomes. Data was analyzed using SPSS version 22. The t-test was used for quantitative data, while the chi-squared

test or Fisher's exact test was used for qualitative data. Associations were examined using chi-square tests and logistic regression when appropriate. Statistical significance was set at  $p < 0.05$ .

## RESULTS

### Demographic Characteristics of Participants (N = 708)

A total of 708 individuals participated in the survey, with a nearly equal distribution of males (51.7%) and females (48.3%). The largest age group was 40–49 years (31.8%). Most participants resided in Arar (75.4%) and were predominantly Saudi nationals (95.3%). Married individuals constituted the majority (62.6%), while 31.2% were single. Educationally, more than half hold a bachelor's degree (58.6%). Employment data showed that the of the study population were governmental employees represented the largest group (48.3%) (Table 1).

### Clinical Characteristics of Participants

The data showed that Diabetes Mellitus (DM) was the most prevalent chronic condition, affecting 36.1%, followed by Hypertension (33.3%). Regarding chickenpox history, 33.1% reported having had it, while 54.2% had not. For herpes zoster, only 5.8% reported a history but 88.6% had not (Table 2).

### Participants' Awareness and Knowledge about Herpes Zoster Vaccine

Awareness of the Herpes Zoster (HZ) vaccine among participants was generally low. Only 15.7% reported they had enough information, while the majority (55.1%) had heard about it but lacked details.

Table 1: Demographic Characteristics of Participants (N = 708)

		Frequency	Percent
Age	18-29	207	29.20
	30-39	90	12.70
	40-49	225	31.80
	50-60	169	23.90
	More than 60	17	2.40
Gender	Male	366	51.70
	Female	342	48.30
Residence	Arar	534	75.40
	Rafha	20	2.80
	Traf	85	12.00
	Other	69	9.70
Nationality	Saudi	675	95.30
	Non-Saudi	33	4.70
Marital status	Single	221	31.20
	Married	443	62.60
	Divorced	18	2.50
	Widowed	26	3.70
Level of education	Below high school	18	2.50
	High school	122	17.20
	Diploma	98	13.80
	Bachelor	415	58.60
	Postgraduate studies	55	7.80
Occupation	Housewife	51	7.20
	Not working	43	6.10
	Governmental employee	342	48.30
	Private sector employee	55	7.80
	Business	18	2.50
	Students	147	20.80
	Retired	52	7.30

Table 2: Clinical Characteristics of Participants

	Frequency	Percent
History of chronic diseases		
Hyperlipidemia	35	16.2
Hypertension	72	33.3
D.M	78	36.1
COPD	13	6.0
Cardiovascular diseases	17	7.9
Chronic kidney diseases	13	6.0
SLE	6	2.8
Others	47	21.8
History of Chickenpox		
Yes	234	33.1
No	384	54.2
Unsure	90	12.7
History of herpes zoster		
Yes	41	5.8
No	627	88.6
Unsure	40	5.6

Data are presented as numbers (No.) and percentages (%)

Table 3: Participants' Awareness and Knowledge of Herpes Zoster Vaccination

	Frequency	Percent
Have you ever received any information related to the herpes zoster vaccine?		
I heard about it and I have enough information	111	15.7
I heard about it, but I don't know the details	390	55.1
I've never heard of it before	207	29.2
HZ vaccine can reduce the incidence of disease by >50%		
No	51	7.2
Yes	320	45.2
I don't know	337	47.6
Do you know if there is an approved vaccine against HZ in KSA?		
No	52	7.3
Yes	303	42.8
I don't know	353	49.9
The shingles vaccine can treat shingles		
No	119	16.8
Yes	169	23.9
I don't know	420	59.3
There is no need to take the vaccine if a person was infected with smallpox as a child		
No	177	25.0
Yes	100	14.1
I don't know	431	60.9
The shingles vaccine is no longer needed if a person has had shingles		
No	89	12.6
Yes	197	27.8
I don't know	422	59.6
The shingles vaccine should be given to		
Neonate	38	5.4
Children	44	6.2
Adults	155	21.9
Elderly above 50 years	285	40.3
All age groups	322	45.5
When you contact a person with shingles, how do you protect yourself?		
Wear mask	151	21.3
Don't share food	157	22.2
No hugs or handshakes	248	35.0
Do not use the same tools	267	37.7
Have medications	85	12.0
Have the vaccine	280	39.5
Do nothing	216	30.5
Vaccination can be taken by any group(s) of people		
If you have/ don't have/are unsure of the history of chickenpox infection	206	29.1
Had chickenpox, but no herpes zoster	82	11.6
He had herpes zoster before	71	10.0
If there are adverse reactions to vaccination	74	10.5
I don't know	408	57.6

Data are presented as numbers (No.) and percentages (%)

Less than half knew the vaccine could reduce HZ incidence by over 50% (45.2%,  $n = 320$ ) and only 42.8% ( $n = 303$ ) were aware of its approval in Saudi Arabia, with the largest group uncertain in both cases. Most participants were unsure about whether the vaccine can treat shingles (59.3%). Regarding target groups, the highest responses indicated the vaccine should be given to all age groups (45.5%) and the elderly above 50 years (40.3%) (Table 3).

Regarding awareness of the herpes zoster vaccination, 451 (63.7%) had poor knowledge, 219 (30.9%) had moderate knowledge and 38 (5.4%) had good knowledge, (Figure 1).

#### Participants' Attitude toward the Herpes Zoster Vaccine

The majority of participants expressed strong interest in learning more about herpes zoster prevention (83.6%) and recognized the vaccine as effective (78.8%). However, only 14.8% reported having received the HZ vaccine. Most participants considered the adult vaccination procedure simple (75.8%). Willingness to receive the vaccine was moderately influenced by its effectiveness (43.5%), potential side effects (44.1%) and the number of required doses (44.9%). Most respondents indicated they would take the vaccine if recommended by a doctor (79.5%) and would

recommend it to friends or relatives (75.4%). A majority were also willing to pay for vaccination (62.6%) (Table 4).

Regarding the herpes zoster vaccine, 278 (39.3%) had a negative attitude, whereas 430 (60.7%) had a positive attitude (Figure 2).

#### Participants' Practice about Shingles Vaccine

Most participants had not received the shingles (HZ) vaccine (82.9%). The main reasons for not getting vaccinated were lack of knowledge about the vaccine (35.9%) and disbelief in vaccines (35.5%), followed by concerns about side effects (20.5%) and perceiving themselves as healthy and not at risk (21.8%,  $n = 154$ ). Regarding vaccine effectiveness, the largest group would consider vaccination if it was at least 50% effective (40.1%), while smaller proportions required higher effectiveness. In the event of HZ or its complications, most participants (84.3%) stated they would go to the hospital immediately, with a minority opting to self-quarantine (15.7%) (Table 5).

Overall, 637 (90.0%) had poor practice regarding the shingles vaccine, while 71 (10.0%) had good practice (Figure 3).

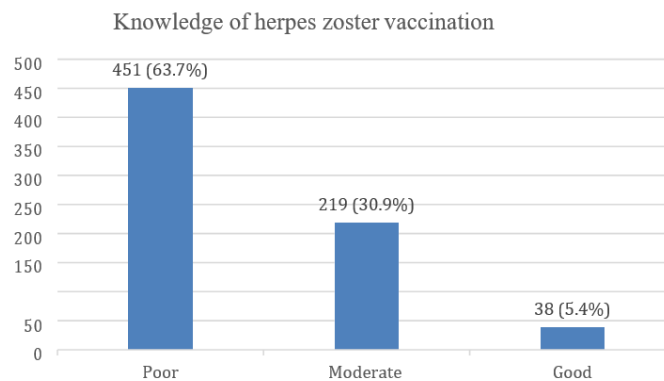


Figure 1: Knowledge of Herpes Zoster Vaccination

#### Attitude toward the herpes zoster vaccine

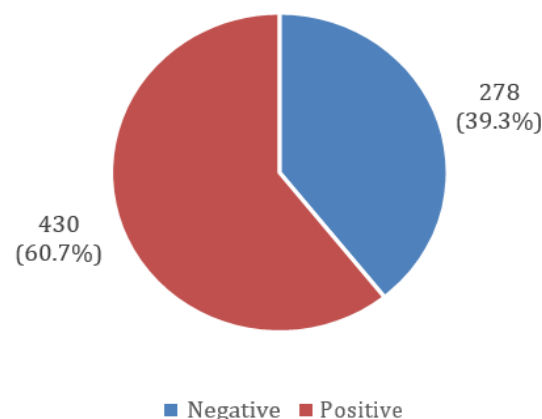


Figure 2: Attitudes toward Herpes Zoster Vaccination

Table 4: Participants' Attitude toward the Herpes Zoster Vaccine

	Frequency	Percent
I am interested in knowing more about the prevention of HZ		
No	116	16.4
Yes	592	83.6
HZ vaccine is effective in prevention against HZ		
No	150	21.2
Yes	558	78.8
Have you been vaccinated with the HZ vaccine?		
No	603	85.2
Yes	105	14.8
The adult vaccination procedure is complex		
No	537	75.8
Yes	171	24.2
The effectiveness of the HZ vaccine will affect your willingness to receive it		
No	400	56.5
Yes	308	43.5
The side effects of the HZ vaccine will affect your willingness to receive it		
No	396	55.9
Yes	312	44.1
The number of doses required for HZ vaccination will affect your willingness to receive it		
No	390	55.1
Yes	318	44.9
I will take the vaccine if the doctor recommends it		
No	145	20.5
Yes	563	79.5
Would you recommend taking the HZ vaccine for a friend or relative?		
No	174	24.6
Yes	534	75.4
Are you in favor of vaccination against HZ, even if you have to pay?		
No	265	37.4
Yes	443	62.6

Data are presented as numbers (No.) and percentages (%)

Table 5: Participants' Practice about Shingles Vaccine

	Frequency	Percent
Have you ever taken a vaccine against shingles?		
No	587	82.9
Yes	121	17.1
What prevent you from getting the shingles vaccine?		
I don't believe in vaccines	251	35.5
I am at risk of contracting it because I am healthy	154	21.8
Consider vaccination too risky	92	13.0
Inability to afford	67	9.5
I did not know about the vaccine	254	35.9
I am concerned about the side effects of the vaccine	145	20.5
I prefer to take medicine when I am sick	24	3.4
I think it's a waste of money	34	4.8
Not covered by health insurance	82	11.6
What is the minimum effectiveness of the HZ vaccine at which you would consider vaccination		
<50%	284	40.1
<60%	6	8.5
<70%	0	
<70%	08	15.3
<80%	8	12.3
<80%	7	
<90%	8	12.1
<90%	6	
100%	8	11.7
100%	3	
If you have HZ/HZ complications		
Will you go to hospital immediately	597	84.3
Will you self-quarantine	111	15.7

Data are presented as numbers (No.) and percentages (%)

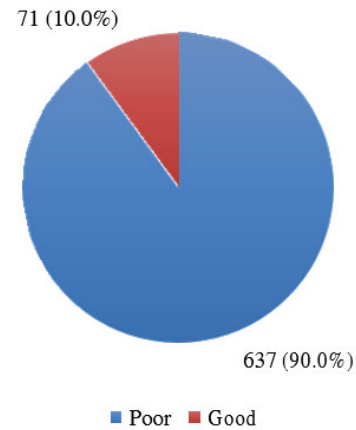


Figure 3: Practice about Shingles Vaccine

### Awareness and Knowledge of Herpes Zoster Vaccination across Demographic Factors

The analysis of awareness and knowledge of herpes zoster vaccination revealed that nationality was the only significant factor ( $p = 0.032$ ). Non-Saudis had a higher percentage of moderate knowledge (51.5%) compared to Saudis (29.9%). Other demographic factors, including age ( $p = 0.118$ ), gender ( $p = 0.807$ ), residence ( $p = 0.091$ ), marital status ( $p = 0.107$ ), education level ( $p = 0.091$ ) and occupation ( $p = 0.076$ ), did not show statistically significant differences (Table 6).

This analysis presents the results of a logistic regression examining the predictors of awareness related to the Herpes Zoster (HZ) vaccine. Age was a significant predictor, with participants aged 30–39 years (OR = 2.718, 95% CI: 1.462–5.055,  $p = 0.002$ ) and 40–49 years (OR = 2.651, 95% CI: 1.610–4.364,  $p < 0.001$ ) being more likely to have information about the HZ vaccine compared to those aged 50 years or older. Place of residence also showed a significant association, as individuals living in “Other” cities had lower odds of being informed about the vaccine (OR = 0.497, 95% CI: 0.258–0.956,  $p = 0.036$ ) compared to those living in Arar. Interestingly, participants with higher education were less likely to be informed (OR = 0.642, 95% CI: 0.446–0.924,  $p = 0.017$ ) and those without a history of herpes zoster also showed reduced awareness (OR = 0.330, 95% CI: 0.121–0.897,  $p = 0.030$ ). Other variables including gender, nationality, marital status and history of chickenpox were not significantly associated with vaccine-related information (Figure 4).

### Attitude toward the Herpes Zoster Vaccine across Demographic Factors

The analysis of attitudes toward the herpes zoster vaccine identified several significant factors. Gender was a significant factor ( $p = 0.008$ ), with females (65.8%) showing a higher percentage of positive attitudes compared to males (56.0%). Nationality was highly significant ( $p < 0.001$ ), as non-Saudis had a much lower percentage of positive attitudes (24.2%) than Saudis (62.5%). Marital status was also significant ( $p = 0.002$ ), with married individuals (65.7%) demonstrating better attitudes compared to singles (54.8%), divorced (38.9%) and widowed (42.3%) individuals.

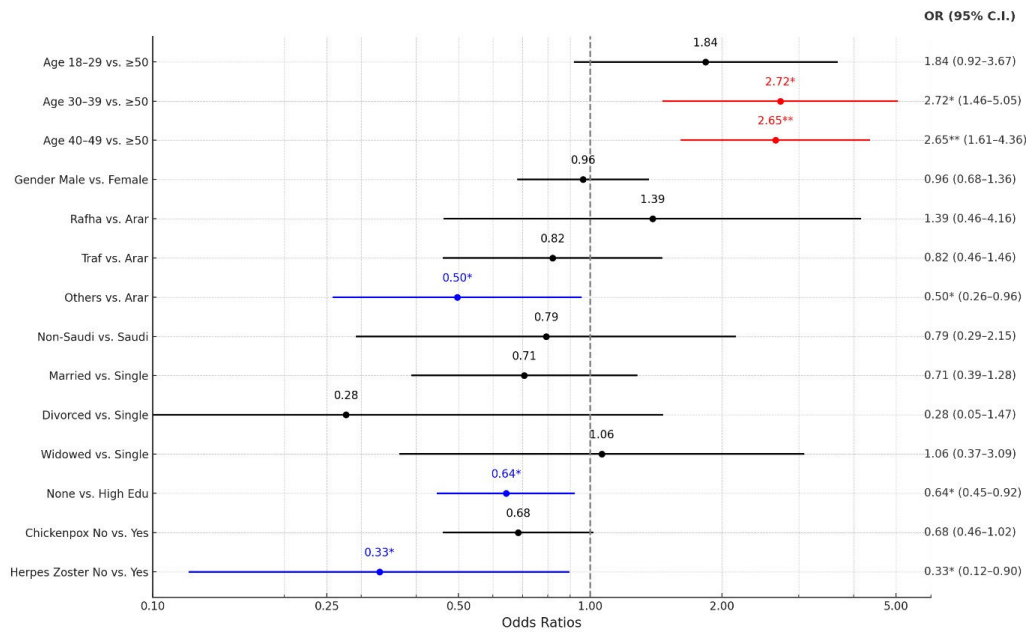


Figure 4: Logistic Regression Analysis of Factors Associated with Information Related to the Herpes Zoster Vaccine

Table 6: Awareness and Knowledge of Herpes Zoster Vaccination across Demographic Factors

Parameters	Awareness and knowledge of herpes zoster vaccination						p-value	
	Poor		Moderate		Good			
	N	Percentage	N	Percentage	N	Percentage		
Age	18-29	132	63.8	62	30.0	13	6.3	0.118
	30-39	66	73.3	21	23.3	3	3.3	
	40-49	150	66.7	63	28.0	12	5.3	
	50-60	95	56.2	66	39.1	8	4.7	
	More than 60	8	47.1	7	41.2	2	11.8	
Gender	Male	229	62.6	117	32.0	20	5.5	0.807
	Female	222	64.9	102	29.8	18	5.3	
Residence	Arar	350	65.5	156	29.2	28	5.2	0.091
	Rafha	11	55.0	6	30.0	3	15.0	
	Traf	55	64.7	26	30.6	4	4.7	
	Other	35	50.7	31	44.9	3	4.3	
Nationality	Saudi	436	64.6	202	29.9	37	5.5	0.032*
	Non-Saudi	15	45.5	17	51.5	1	3.0	
Marital status	Single	148	67.0	59	26.7	14	6.3	0.107
	Married	282	63.7	138	31.2	23	5.2	
	Divorced	8	44.4	10	55.6	0	0.0	
	Widowed	13	50.0	12	46.2	1	3.8	
Level of education	Below high school	7	38.9	11	61.1	0	0.0	0.091
	High school	82	67.2	35	28.7	5	4.1	
	Diploma	59	60.2	35	35.7	4	4.1	
	Bachelor	273	65.8	117	28.2	25	6.0	
	Postgraduate studies	30	54.5	21	38.2	4	7.3	
Occupation	Housewife	31	60.8	18	35.3	2	3.9	0.076
	Not working	28	65.1	11	25.6	4	9.3	
	Governmental employee	224	65.5	95	27.8	23	6.7	
	Private sector employee	37	67.3	18	32.7	0	0.0	
	Business	5	27.8	11	61.1	2	11.1	
	Students	94	63.9	48	32.7	5	3.4	
	Retired	32	61.5	18	34.6	2	3.8	

P: Probability, statistical significance was set at  $p < 0.05$

Education level showed a significant association ( $p = 0.003$ ), with bachelor's degree holders having the highest percentage of positive attitudes (66.3%), while high school graduates had the lowest (47.5%). Occupation was another significant factor ( $p = 0.034$ ), with retired individuals (67.3%) and

housewives (64.7%) showing the highest percentages of positive attitudes, whereas business owners had the lowest (38.9%). Other demographic factors, including age ( $p = 0.183$ ) and residence ( $p = 0.264$ ), did not show statistically significant differences (Table 7).

Table 7: Attitude toward the Herpes Zoster Vaccine across Demographic Factors

		Awareness and knowledge of herpes zoster vaccination				p. value
		Poor		Moderate		
		N	%	N	%	
Age	18-29	86	41.5	121	58.5	0.183
	30-39	36	40.0	54	60.0	
	40-49	81	36.0	144	64.0	
	50-60	64	37.9	105	62.1	
	More than 60	11	64.7	6	35.3	
Gender	Male	161	44.0	205	56.0	0.008*
	Female	117	34.2	225	65.8	
Residence	Arar	205	38.4	329	61.6	0.264
	Rafha	12	60.0	8	40.0	
	Traf	35	41.2	50	58.8	
	Other	26	37.7	43	62.3	
Nationality	Saudi	253	37.5	422	62.5	<.001*
	Non-Saudi	25	75.8	8	24.2	
Marital status	Single	100	45.2	121	54.8	0.002*
	Married	152	34.3	291	65.7	
	Divorced	11	61.1	7	38.9	
	Widowed	15	57.7	11	42.3	
	Below high school	8	44.4	10	55.6	
Level of	High school	64	52.5	58	47.5	0.003*
	Diploma	45	45.9	53	54.1	
	Bachelor	140	33.7	275	66.3	
	Postgraduate studies	21	38.2	34	61.8	
Occupation	Housewife	18	35.3	33	64.7	0.034*
	Not working	17	39.5	26	60.5	
	Governmental employee	119	34.8	223	65.2	
	Private sector employee	27	49.1	28	50.9	
	Business	11	61.1	7	38.9	
	Students	69	46.9	78	53.1	
	Retired	17	32.7	35	67.3	

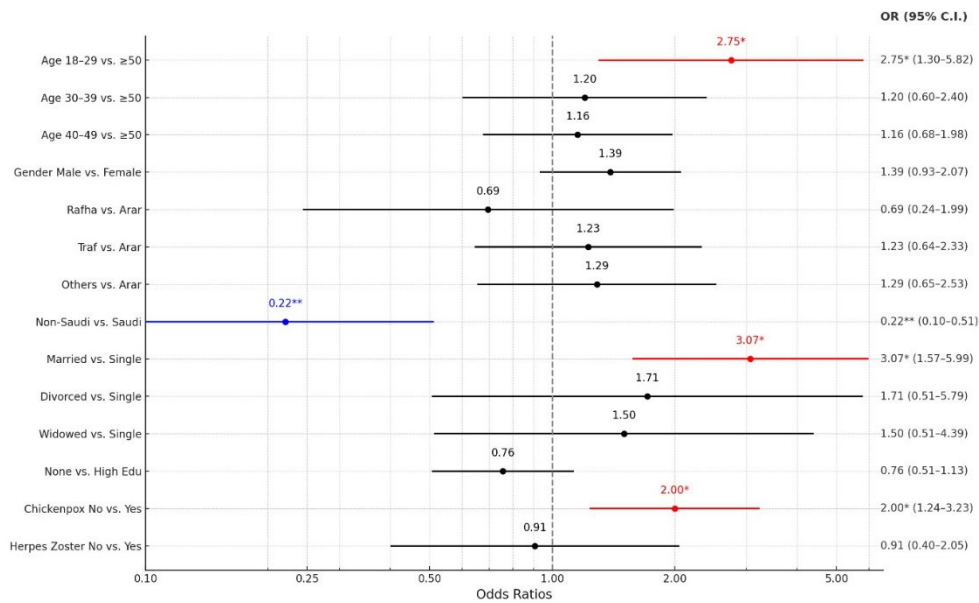


Figure 5: Logistic Regression Analysis of Factors Associated with Attitude toward the Herpes Zoster Vaccine Effectiveness

The analysis identified several factors significantly associated with participants' attitude toward Herpes Zoster (HZ) vaccine effectiveness. Participants aged 18-29 were more than twice as likely (OR = 2.75, 95% CI: 1.30-5.82, p = 0.008) to have a positive attitude compared with those aged ≥50. Non-Saudi participants were significantly less likely to have a positive attitude (OR = 0.22, 95% CI: 0.096-0.51, p<0.001). Being married was strongly associated with a

positive attitude (OR = 3.07, 95% CI: 1.57-5.99, p = 0.001) and participants without a history of chickenpox were about twice as likely to have a positive attitude compared with those who had chickenpox (OR = 1.999, 95% CI: 1.24-3.23, p = 0.005). Other factors-including age groups 30-49, gender, residence, level of education, history of herpes zoster and being divorced or widowed-did not show significant associations with vaccine attitude (Figure 5).

Table 8: Practice Regarding the Shingles Vaccine across Demographic Factors

		Awareness and knowledge of herpes zoster vaccination				p. value
		Poor		Moderate		
		N	%	N	%	
Age	18-29	183	88.4	24	11.6	0.615
	30-39	80	88.9	10	11.1	
	40-49	205	91.1	20	8.9	
	50-60	155	91.7	14	8.3	
	More than 60	14	82.4	3	17.6	
Gender	Male	330	90.2	36	9.8	0.860
	Female	307	89.8	35	10.2	
Residence	Arar	481	90.1	53	9.9	0.973
	Rafha	18	90.0	2	10.0	
	Traf	77	90.6	8	9.4	
	Other	61	88.4	8	11.6	
Nationality	Saudi	607	89.9	68	10.1	0.854
	Non-Saudi	30	90.9	3	9.1	
Marital status	Single	194	87.8	27	12.2	0.459
	Married	402	90.7	41	9.3	
	Divorced	16	88.9	2	11.1	
	Widowed	25	96.2	1	3.8	
Level of education	Below high school	17	94.4	1	5.6	0.309
	High school	110	90.2	12	9.8	
	Diploma	92	93.9	6	6.1	
	Bachelor	366	88.2	49	11.8	
	Postgraduate studies	52	94.5	3	5.5	
Occupation	Housewife	45	88.2	6	11.8	0.240
	Not working	41	95.3	2	4.7	
	Governmental employee	309	90.4	33	9.6	
	Private sector employee	52	94.5	3	5.5	
	Business	18	100.0	0	0.0	
	Students	126	85.7	21	14.3	
	Retired	46	88.5	6	11.5	

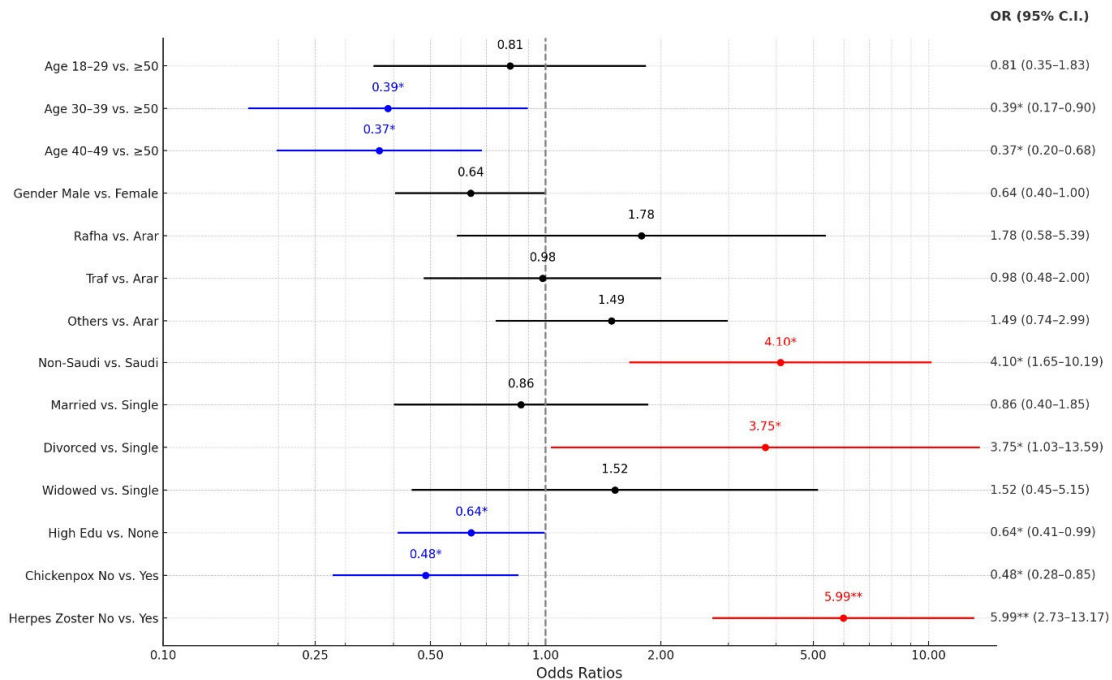


Figure 6: Logistic Regression Analysis of Factors Associated with Shingles Vaccine Uptake Practices

**Practice Regarding the Shingles Vaccine across Demographic Factors**

The analysis of practice regarding the shingles vaccine showed no significant differences across any demographic

factors. Age (p = 0.615), gender (p = 0.860), residence (p = 0.973), nationality (p = 0.854), marital status (p = 0.459), education level (p = 0.309) and occupation (p = 0.240) (Table 8).

This analysis presents the results of a logistic regression examining the predictors of shingles vaccine uptake practices. Participants aged 30–39 (OR = 0.387, 95% CI: 0.167–0.897,  $p = 0.027$ ) and 40–49 (OR = 0.367, 95% CI: 0.198–0.682,  $p = 0.002$ ) were less likely than those  $\geq 50$  to have the outcome of interest. Non-Saudi participants were over four times more likely to have the outcome compared with Saudis (OR = 4.10, 95% CI: 1.65–10.19,  $p = 0.002$ ). Divorced participants were more likely than singles to have the outcome (OR = 3.75, 95% CI: 1.03–13.59,  $p = 0.045$ ). Higher education was associated with lower odds (OR = 0.639, 95% CI: 0.411–0.995,  $p = 0.047$ ) and participants without a history of chickenpox were less likely than those with a history (OR = 0.485, 95% CI: 0.278–0.848,  $p = 0.011$ ). A history of herpes zoster strongly increased the odds (OR = 5.99, 95% CI: 2.73–13.17,  $p < 0.001$ ). Other factors including gender, residence, marital status (married/widowed) and age 18–29 were not significantly associated (Figure 6).

## DISCUSSION

Herpes Zoster (HZ) continues to remain a major public health concern, especially for immunocompromised people and older adults. Even with the availability of effective vaccines, regional and worldwide uptake is still below optimal. Understanding the community's Knowledge, Attitudes and Practices (KAP) regarding HZ vaccination is essential for effective public health strategies. KAP assessments help identify educational gaps, vaccine hesitancy drivers and barriers to uptake. The present study provides important insights KPA toward Herpes Zoster Vaccination (HZV) among adults in the Northern Border Region of Saudi Arabia. Consistent with prior Saudi-based research, our findings revealed low knowledge and awareness levels, relatively positive attitudes toward vaccination, but poor vaccination uptake despite widespread interest in learning more about the disease and its prevention.

### Knowledge and Awareness of Herpes Zoster and HZV

A considerable gap was detected in awareness and knowledge regarding herpes zoster disease and its vaccination among participants. Most participants had heard of herpes zoster and recognized its potential severity and complications, yet a substantial proportion lacked adequate knowledge about the availability and benefits of the HZ vaccine. Only 15.7% of them indicated that they had sufficient information and nearly one-third had never heard of the vaccine at all. This finding suggests that general awareness exists, but it is largely superficial and insufficient to support informed health decisions. This gap in awareness mirrors findings from studies conducted in central and western regions of Saudi Arabia, including Riyadh and Jeddah, where awareness of herpes zoster disease was relatively high, but knowledge of vaccination recommendations remained limited [20–24]. Similarly, studies from the Eastern Province and Makka have reported insufficient public knowledge regarding adult vaccines, including HZV, despite increasing exposure to health

information [24–27]. Conversely, other studies conducted in the kingdom and other countries reported high awareness rate. This discrepancy may be attributed to facility availability and utilization [21,28].

Knowledge regarding vaccine effectiveness was notably limited. Less than half of participants (45.2%) correctly identified that the herpes zoster vaccine can reduce disease incidence by more than 50%, while nearly the same proportion were unsure. This uncertainty may contribute to vaccine hesitancy, as perceived effectiveness is a well-established determinant of vaccine acceptance [29]. The lack of clarity surrounding vaccine efficacy shows that inadequate understanding of vaccine benefits is a major barrier to uptake among adults. Awareness of the availability of an approved HZV in Saudi Arabia was also suboptimal. Almost half of the participants did not know whether an approved vaccine exists in the Kingdom, despite its availability. This reflects a gap in public health communication and highlights the need for clearer dissemination of national immunization policies. Previous studies have demonstrated that awareness of vaccine availability and official recommendations significantly influences vaccination behavior [27,30].

A substantial proportion of participants believed that the vaccine could treat shingles or were uncertain about this, despite vaccination being preventive rather than therapeutic. In addition, most respondents were unsure whether vaccination is necessary after childhood infections such as smallpox or after a previous episode of herpes zoster. These misunderstandings have been widely documented in the literature and are clinically significant, as vaccination is recommended even for individuals with a history of herpes zoster to reduce the risk of recurrence [31].

Regarding target populations, although 40.3% correctly identified adults over 50 years as candidates for vaccination, nearly half of the participants believed that the vaccine should be given to all age groups, including children and neonates. This finding indicates confusion about age-specific vaccine recommendations and underscores the lack of knowledge regarding risk stratification for herpes zoster, which primarily affects older adults and immunocompromised individuals [32].

Protective behaviors reported when contacting a person with shingles were variable and often inconsistent with evidence-based recommendations. While a relatively high proportion recognized vaccination as a protective measure, many participants relied on non-specific actions or reported doing nothing. This reflects a limited understanding of herpes zoster transmission and prevention and further emphasizes the need for targeted educational interventions.

Overall, the high proportion of “I don't know” responses across most items indicates widespread uncertainty rather than firmly held incorrect beliefs. This represents an important opportunity for public health authorities to improve awareness through structured education campaigns, healthcare provider counseling and inclusion of adult vaccination topics in routine health communication. Improving knowledge about herpes zoster vaccination could

enhance vaccine acceptance, reduce disease burden and prevent complications associated with herpes zoster, particularly among older adults.

Logistic regression further identified age as a significant predictor of awareness, with participants aged 30-39 years and 40-49 years being more likely to have vaccine-related information compared with those aged  $\geq 50$  years. Interestingly, higher education was associated with lower awareness, suggesting that formal education alone does not ensure adequate vaccine knowledge and highlighting gaps in adult health education. This contrasts with other studies that detected that higher education was associated with better knowledge about HZ disease and its vaccination findings [21,26].

### Attitudes toward Herpes Zoster Vaccination (HZV)

Attitudinal findings from this study indicate a largely positive perception of HZ prevention and vaccination, despite a relatively low rate of actual vaccine uptake. A large majority of participants expressed interest in learning more about HZ prevention and acknowledged the effectiveness of the HZ vaccine, reflecting a favorable perception of vaccination benefits. These findings suggest that awareness and perceived usefulness of the HZ vaccine are relatively high among the study population; however, this positive attitude has not yet translated into widespread vaccine acceptance and coverage.

Although more than three-quarters of participants believed that the HZ vaccine is effective, only a small proportion reported having received the vaccine. This discrepancy between favorable attitudes and low vaccination rates has been reported in previous studies and may be attributed to several factors, including lack of physician recommendation, limited access, cost and concerns about vaccine safety or necessity in adulthood. These attitudes are comparable to those reported in studies from the Riyadh and Makkah regions, Al Ahsa, where positive beliefs regarding vaccine effectiveness were common, even among unvaccinated individuals [16,27,28]. However, as observed in other Saudi regions, positive attitudes did not translate into high vaccination coverage.

Concerns related to vaccine effectiveness, side effects and the number of required doses were found to influence willingness to receive the HZ vaccine in a substantial proportion of participants. These findings are consistent with previous research showing that fear of adverse effects and uncertainty about long-term protection remain significant barriers to adult vaccination. This is particularly relevant for the recombinant zoster vaccine, which requires two doses and is commonly associated with mild to moderate local and systemic reactions. While these side effects are generally self-limiting, they may negatively affect vaccine acceptance if not adequately explained [33,34].

Actual uptake of the HZ vaccine in the Northern Border Region was low, with less than one-fifth of participants reporting prior vaccination and nearly four-fifths of participants indicated that they would receive the HZ vaccine if it were recommended by a doctor. This uptake rate is similar to or lower than rates reported in studies from

urban regions of the Kingdom, highlighting a consistent gap between favorable attitudes and preventive behavior nationwide. Physician recommendation emerged as a critical factor influencing willingness to vaccinate, consistent with evidence from multiple Saudi studies showing that healthcare provider endorsement is among the strongest predictors of adult vaccine acceptance [24,35,36].

Cost also played a notable role in shaping attitudes toward HZ vaccination. While a majority of participants were willing to receive the vaccine even if payment was required, a considerable minority were unwilling to do so. Financial barriers have been repeatedly identified as a major obstacle to adult immunization, particularly in settings where vaccines are not fully subsidized [31]. Incorporating HZ vaccination into national immunization programs or insurance coverage schemes may significantly enhance vaccine uptake.

Positive attitudes were significantly associated with several sociodemographic factors. Females and married participants demonstrated a higher rate of positive attitudes compared with others. These findings similar to other study showed highlighted positive attitude of female specially married one [27,33]. Higher educational level also showed a significant association, with bachelor's degree holders exhibiting the highest positive attitude. These findings may reflect greater health-seeking behavior among women, increased healthcare engagement among married individuals and heightened disease awareness among retirees. Conversely, the lower positivity among non-Saudis- despite higher knowledge- suggests potential concerns related to healthcare access, cost, or trust in the local health system [27,36].

Logistic regression further demonstrated that younger adults (18-29 years) were more likely to hold positive attitudes toward vaccine effectiveness. This may reflect broader vaccine acceptance trends among younger populations exposed to digital health information and recent mass immunization campaigns.

Overall, the findings suggest that while attitudes toward HZ vaccination are largely positive, practical barriers and vaccine-related concerns continue to limit actual vaccination rates. Targeted educational interventions focusing on vaccine safety, effectiveness and the burden of HZ disease, combined with strong healthcare provider recommendations and improved vaccine accessibility, may help bridge the gap between positive attitudes and vaccine uptake

### Practice toward Herpes Zoster Vaccination (HZV)

The present study identified a low uptake of herpes zoster vaccination despite the availability of effective vaccines, with less than one-fifth of participants reporting prior vaccination against shingles. This finding is consistent with global evidence indicating suboptimal coverage of herpes zoster vaccines among eligible adult populations, particularly in regions where adult immunization programs are less established [29,33].

Several barriers to vaccination were reported, reflecting both informational and perceptual challenges. A substantial proportion of participants indicated that they were unaware of the existence of the shingles vaccine, highlighting

insufficient public awareness and health communication. Lack of knowledge has been repeatedly cited as a major determinant of low herpes zoster vaccine uptake and underscores the need for targeted educational interventions [21,27,28,36,37].

Vaccine hesitancy also emerged as a critical issue. More than one-third of respondents reported disbelief in vaccines, while others perceived vaccination as unnecessary due to their perceived good health. This misconception reflects a limited understanding of herpes zoster pathophysiology, as the disease results from reactivation of latent varicella-zoster virus and can occur even in otherwise healthy individuals, with risk increasing with age and immunosenescence [34,38].

Concerns about vaccine safety and side effects were also prominent, with a notable proportion of participants considering vaccination too risky or expressing fear of adverse effects. Although herpes zoster vaccines - particularly the recombinant zoster vaccine- have demonstrated high efficacy and acceptable safety profiles, reactogenicity remains a concern for some individuals and may negatively influence decision-making if not properly addressed by healthcare providers [33,39].

Financial and structural barriers further contributed to low vaccine uptake. Inability to afford the vaccine and lack of insurance coverage were reported by a considerable segment of participants. These findings align with previous studies showing that cost and lack of reimbursement are major obstacles to adult immunization, particularly in healthcare systems where preventive vaccines are not universally covered [30,31,27]. Policy-level interventions, including insurance coverage and national vaccination programs, may therefore be essential to improve accessibility.

The study also explored participants' expectations regarding vaccine effectiveness. A substantial proportion of respondents indicated that they would consider vaccination only if vaccine effectiveness reached high levels, reflecting a preference for near-complete protection. This expectation may be unrealistic and suggests limited understanding of vaccine efficacy metrics, as even vaccines with moderate-to-high effectiveness can substantially reduce disease incidence and severity at the population level [39]. Clear communication regarding realistic benefits and public health impact is therefore critical.

In contrast, attitudes toward disease management appeared more favorable, as the majority of participants reported that they would seek immediate hospital care if they developed herpes zoster or its complications. This finding suggests that while preventive behaviors such as vaccination remain limited, recognition of disease severity and the need for medical care is relatively high. This pattern further emphasizes a reactive rather than preventive health approach, which has been observed in other adult vaccination contexts [29].

Notably, vaccine practice did not significantly differ across demographic variables, suggesting that poor uptake is a population-wide issue rather than one confined to specific subgroups. However, regression analysis identified prior HZ infection as the strongest predictor of vaccine uptake, indicating that personal disease experience substantially increases perceived benefit and motivates preventive action.

Regression analysis revealed that participants with a history of herpes zoster were nearly six times more likely to have received the vaccine, indicating that personal disease experience strongly motivates preventive behavior. In contrast, participants aged 30-49 years and those with higher education were significantly less likely to demonstrate good vaccination practice, further emphasizing that awareness and education do not necessarily translate into action.

Overall, the findings indicate that low herpes zoster vaccine uptake is driven by a combination of limited awareness, vaccine hesitancy, safety concerns and financial barriers. Addressing these issues will require multifaceted strategies, including public education campaigns, strong healthcare provider recommendations, transparent communication about vaccine safety and effectiveness and improved vaccine affordability. Strengthening adult immunization policies may play a pivotal role in shifting attitudes from treatment-oriented to prevention-focused healthcare behavior.

## CONCLUSION

In summary, among adults in the Northern Border Region of Saudi Arabia, knowledge and awareness of shingles and its vaccine remain low, though attitudes towards vaccination are generally favorable. However, actual uptake is very low, reflecting the persistent knowledge- attitude-practice gap observed in national and international studies. To improve prevention of shingles and its complications, especially in older adults, coordinated efforts are required: enhanced public education, stronger physician recommendation, improved access and adult vaccination infrastructure and targeted messaging that addresses barriers (perceived risk, safety and cost). Implementing these strategies can help bridge the gap between favorable attitudes and actual vaccination.

## Ethical Statement

The Northern Border University Local Committee of Bioethics (HAP-09-A-043) approved this study (decision number: 24/25/H), dated 11th February 2025.

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