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Original Article

A cross-sectional assessment of refusal factors towards polio vaccination

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Poliomyelitis is a contagious disease that still remains in Pakistan, despite efforts to ensure full vaccination coverage, but, in counterpart, refusal is prevailing. Therefore, the present study was conducted to assess refusal factors to polio vaccination. A cross-sectional approach was followed for the present study which was conducted in the North Waziristan Tribal District (polio endemic area) between January 2023 to July 2023. Data were collected on a self-developed questionnaire. The study participants were from the general public and were recruited through simple random sampling. The data were analyzed using Statistical package for social sciences SPSS. A total of 387 respondents completed the survey, amongst which most of the respondents were male (90.7%), living in a joint family (87.1%), and had primary education (48.3%). Most of the respondents showed poor knowledge regarding polio disease (58.7%). Religious extremism, poor knowledge regarding the disease and joint family culture were the significant predictors of the refusal of polio vaccination. This refusal may cause the re-emergence of polio outbreaks.

Keywords: polio; vaccination; vaccine refusal.

Introduction

Poliomyelitis caused by poliovirus is a contagious and life-threatening acute paralytic disease that causes severe neuron damage, which leads to paralysis.[1,2] Poliovirus is classified as an enterovirus within the *Picornaviridae* family. It has three serotypes (1, 2, and 3) that can cause paralytic disease.[3] Poliovirus is usually transmitted via the fecal-oral route, thus, areas with poor sanitation are at high risk. In addition, direct contact with an infected person may cause polio disease.

The Global Polio Eradication Initiative (GPEI) founded in 1988, played a significant role in the eradication of polio globally. Remarkable strides have been made in combating wild polio virus (WPV) serotypes; specifically, types 2 and 3 have been successfully eradicated, leading to a staggering reduction of over 99.9% in global WPV cases.[4] However, despite these achievements, the challenge persists in Afghanistan and Pakistan, the only remaining countries where indigenous transmission of WPV type 1 (WPV1) has not been halted.[5,6,7] In 2019, 147 cases were reported, followed

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by 84 cases in 2020 and 1 case in 2021. After this decline in cases, in 2022, 20 WPV1 cases were reported.[5]

Despite the continuous effort and strategies built up in eradicating polio, Pakistan still is counted among the few countries that have a high ratio of polio cases in contrast to other countries of the world.[8]. It has been reported that most polio cases are observed and recorded in the region of Federal Administered Tribal Areas (FATA), which are part of the Northern side of Pakistan. This area has been affected by the war on terror for more than 2 decades. It has been observed that polio vaccination has been banned several occasions by religious extremists in this area.[9] As a result, most children remain unvaccinated and become prone to polioviruses.[5] In addition, there is a lack of education facilities and access to education. Therefore, it is assumed that lack of awareness, terrorism and inaccessibility to polio vaccination may influence the refusal of polio vaccination. Therefore, the current study was aimed to assess factors that play a role in polio vaccination refusal.

Materials and Methods

A descriptive cross-sectional approach was used for the current study and was conducted between January 2023 to July 2023. The study setting was District North Waziristan located in the southern area of Khyber Pakhtunkhwa, Pakistan. This is the border-side area located near the Pak-Afghan border. The total population of this area is 693,332.[10] The study participants were general population residents of District North Waziristan. The inclusion criteria for this study were the parents, whether they vaccinated their children or not, and residents of the district north Waziristan.

Sample size and sampling

The Raosoft sample size calculator was used for sample calculation. The calculated sample size was 384, and a 5% dropout rate was added, thus, the final sample size was 403. Participants in the current study were selected using a simple random sampling technique.

Study instrument and data collection

The study questionnaire was designed based on the previously published literature.[11,12] Two experts from the same background validated the initial draft, with their suggested changes integrated into the study questionnaire before the pilot study. The study was piloted on 10% of the total sample size (n = 36) to assess the internal consistency of the study instrument. A crone-Bach Alpha value of 0.71 was obtained, which shows a valid internal consistency. The participants of the pilot study were excluded from the final analysis.

The data were obtained using Google Forms (Google, Inc, USA). The Urdu translation was incorporated into the questionnaire and was carried out by experts in the field using forward and backward translation methods. The data was collected using a local trained data collector.

The questionnaire was composed of three domains. The first domain was related to the demographic data of the participants, including age, gender, family structure, marital status, and education. The family structure (joint: an extended family, typically consisting of three or more generations and their spouses, living together as a single household; nuclear: a couple and their dependent children, regarded as a basic social unit) was incorporated as it has a role in child care.[13] The second domain was related to knowledge about the nature of poliovirus, its transmission and risk factors. The third domain was related to the refusal factors, including religion, terrorism, lack of local mobility, lack of awareness about polio and polio vaccination and parenteral obligation. The responses were collected on a yes and no basis. The correct response was assigned 1 point, while the incorrect was awarded with 0-point. Regarding knowledge, we used a cut-off point of 50% (<50% - poor, >50% - good). The detail of the questionnaire is given in Table 1.

Ethic

The ethical approval was taken from the Ethical Committee of Kohat University of Science and Technology, Kohat, Pakistan. Participants were treated as per the Declaration of Helsinki. The participant's confidentiality was maintained throughout the study. Informed consent was obtained from each participant.

Table 1. Questionnaire used in the current study.

D1	**Demographics**			
	Age (years)			
	Gender	Male	Female	
	Family structure	Joint	Nuclear	
	Marital status	Single	Married	
	Education	No formal education	Primary	
		Secondary	University	
	Polio vaccination refusal		Yes	No
D2	**Knowledge**			
	Polio is a viral disease		Yes	No
	Children under five years at risk to polio		Yes	No
	Polio is usually spread via the fecal-oral route		Yes	No
D3	**Refusal factors**			
	D 3.1: Religion			
	Do you consider that people refused to vaccination due to religion		Yes	No
	Do you consider religion cause misconception regarding polio vaccination		Yes	No
	Do you consider vaccination prohibition in Islam due to the perception of pork ingredients (haram in Islam)		Yes	No
	Do you consider the religious leader role as a barrier in vaccination program		Yes	No
	D 3.2: Terrorism			
	Religious militant and extremist groups prohibiting polio vaccination		Yes	No
	Due to terrorism, the polio vaccination coverage is limited		Yes	No
	Due to terrorism, public are not actively participating in the polio vaccination program		Yes	No
	D 3.3: Local mobility			
	Polio vaccination campaign is holding in your		Yes	No
	Do you observed polio campaigning including post, door to door and mobile messages		Yes	No
	Do you consider a lack of communication between polio team and the community		Yes	No
	D 3.4: Lack of awareness			
	Polio drops are good for the society		Yes	No
	Polio virus is hazardous to the children		Yes	No
	Polio can paralyze the children		Yes	No
	D 3.5: parenteral obligation			
	Polio vaccination is beneficial for children		Yes	No
	Polio causes the allergic reaction		Yes	No

Statistical analysis

The data were analyzed using Statistical package for social sciences (SPSS v25). The categorical data were presented as frequency and percentages, while the continuous data were tabulated as mean and standard deviation. The parametric test, Chi-square test, was applied based on the normality test, as the data showed normal distribution. To identify the predictors of the polio refusal, logistic regression analysis was used. The two-tailed p-value was considered significant at ≤0.05.

Results

A total of 387 respondents completed the survey (response rate: 96.02%), amongst which most of the respondents were male (90.7%), living in a joint family (87.1%) and had primary education (48.3%). Most of the respondents showed poor knowledge regarding polio disease (58.7%), as shown in Table 2.

Regarding the polio vaccination refusal, the respondents reported that lack of awareness, terrorism and religious extremism have a role in vaccination refusal, as shown in Figure 1 and Figure 2.

The regression analysis showed that religious extremism and the joint family system are a significant predictor of the vaccination refusal. In the multivariate analysis, poor knowledge about polio virus was also a significant predictor of vaccine refusal. The details can be seen in Table 3.

Table 2. Demographic characteristics of the participants.

		Overall N (%)	Polio vaccination refusal		P-value
			Yes (n = 211) N (%)	No (n = 176) N (%)	
Age (mean ± SD)		27.47 ± 7.86	27.73 ± 8.14	27.15 ± 7.53	0.46
Gender	Male	351 (90.7)	189 (89.6)	162 (92.0)	0.40
	Female	36 (9.3)	22 (10.4)	14 (8.0)	
Family structure	Joint	337 (87.1)	191 (90.5)	146 (83.0)	0.02
	Nuclear	50 (12.9)	20 (9.5)	30 (17.0)	
Marital status	Single	107 (27.6)	55 (26.1)	52 (29.5)	0.44
	Married	280 (72.4)	156 (73.9)	124 (70.5)	
Education	No formal education	102 (26.4)	53 (25.1)	49 (27.8)	0.60
	Primary	187 (48.3)	103 (48.8)	84 (47.7)	
	Secondary	22 (5.7)	17 (8.1)	5 (2.8)	
	University	76 (19.6)	38 (18.0)	38 (21.6)	
Knowledge about poliovirus	Poor	227 (58.7)	120 (56.9)	107 (60.8)	0.43
	Good	160 (41.3)	91 (43.1)	69 (39.2)	

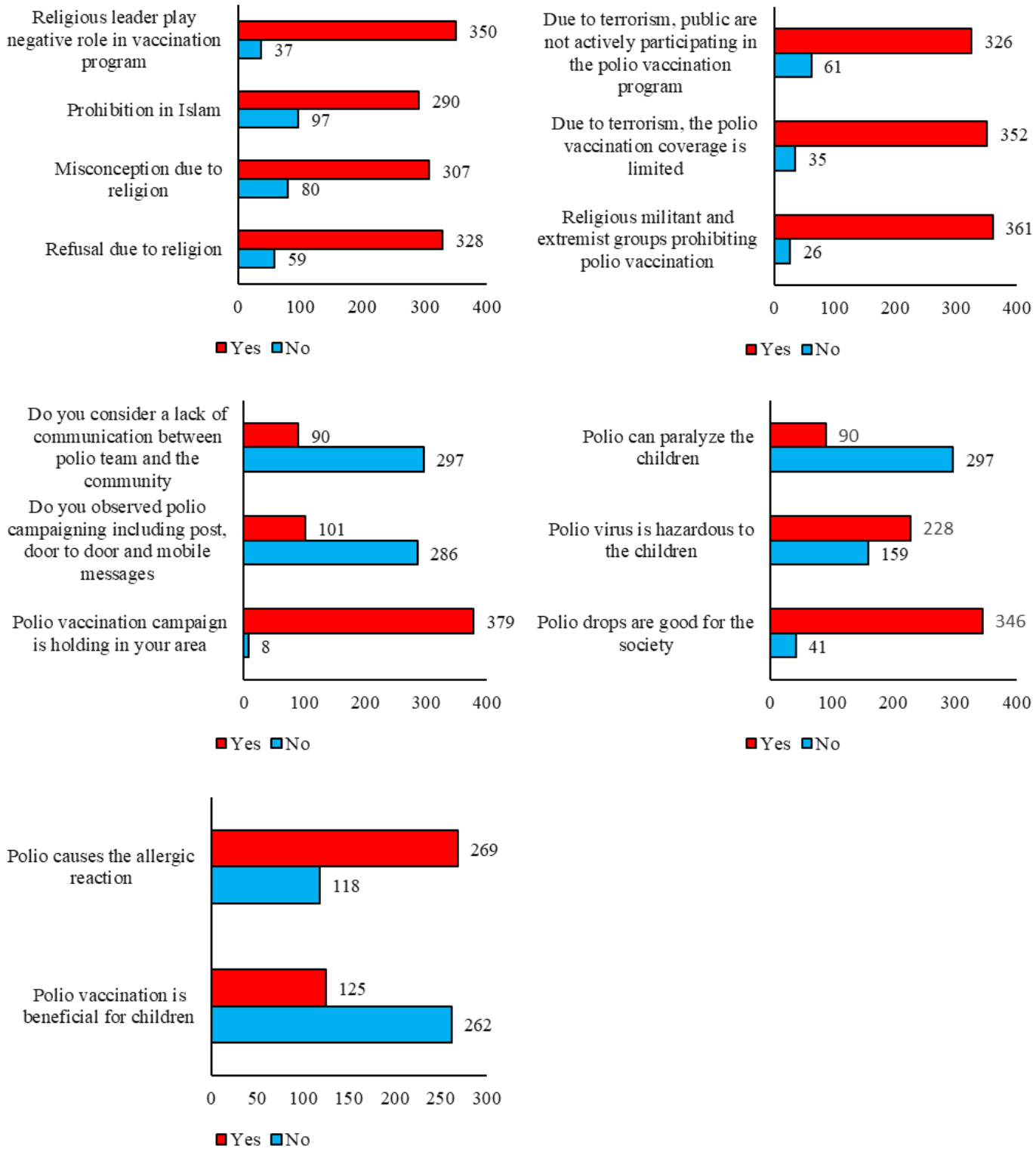

Fig. 1. Parenteral view regarding refusal factors including religion (A), terrorism (B), local mobility (C), lack of awareness (D), parenteral obligations (E).

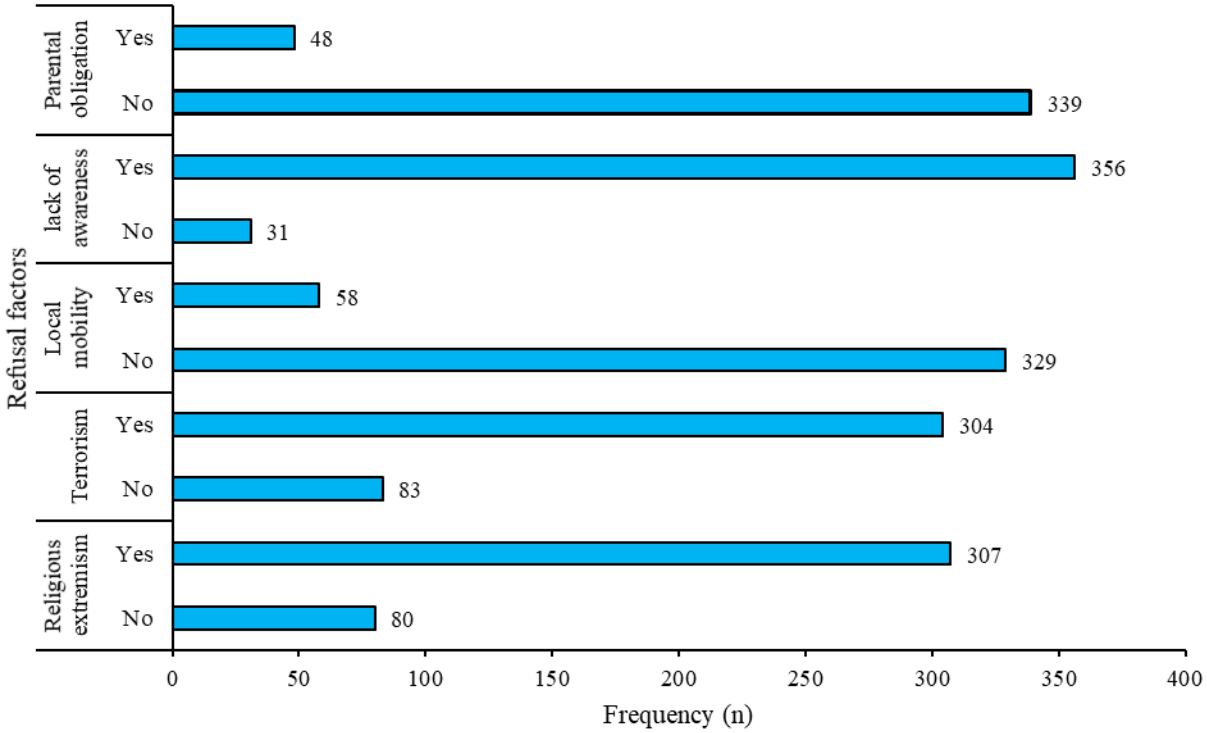

Fig. 2. Role of religious extremism, terrorism, lack of local mobility, lack of awareness, and parental obligation in polio vaccine refusal.

Table 3. Univariate and multivariate regression analysis to assess predictors of polio vaccine refusal.

		Univariate analysis		Multivariate analysis	
		P-value	**OR (95% CI)**	**P-value**	**aOR (95% CI)**
Religious extremism	Yes vs. No	0.01	0.54 (0.33 - 0.89)	0.01	0.47 (0.26 - 0.83)
Terrorism	Yes vs. No	0.95	0.98 (0.60 - 1.60)	0.27	1.39 (0.76 - 2.5)
Lack of local mobilization	Yes vs. No	0.85	0.95 (0.54 - 1.66)	0.84	1.06 (0.59 - 1.8)
Lack of awareness	Yes vs. No	0.97	0.986 (0.47 - 2.06)	0.85	1.08 (0.47 - 2.46)
Parental obligation	Yes vs. No	0.38	0.75 (0.41 - 1.40)	0.51	0.80 (0.43 - 1.52)
Knowledge about polio disease	Poor vs. good	0.43	1.17 (0.78 – 1.76)	0.04	1.38 (0.89 – 2.32)
Family structure	Joint vs. nuclear	0.02	1.96 (1.07 – 3.59)	0.02	1.99 (1.07 – 3.69)

OR: Odds ratio. aOR: adjusted Odds ratio. CI: confidence interval.

Discussion

The current study aimed to assess the factors that play a role in polio vaccination refusal in a conflict area of Pakistan. Nearly half of the sample population (45.5%) reported refusal to polio vaccination. The regression analysis showed that religious extremism, poor knowledge regarding the disease and joint family structure play a significant role in polio vaccine refusal. The observation that a considerable proportion of the respondents showed refusal to polio vaccination can lead to the re-emergence of polio, a highly infectious and potentially deadly disease. When a significant portion of the population refuses vaccination, the disease can spread and cause outbreaks; this not only puts unvaccinated individuals at risk, but also poses a threat to the overall public health.[14,15] Additionally, the refusal of polio vaccination can hinder global efforts to eradicate the disease, as it relies on high vaccination coverage to prevent transmission.[16]. Therefore, the refusal of polio vaccination can have serious consequences for both individual and public health.

There is a complex interplay between religious extremism and polio vaccination refusal. Religious extremism and terrorism have been identified as significant factors contributing to polio vaccination refusal in Pakistan. Misconceptions and religious beliefs play a role in shaping the attitudes of parents and caretakers toward polio vaccines. These misconceptions include the belief that vaccines are part of American and Jewish conspiracies, that vaccines are un-Islamic and aimed at sterilizing young Muslims, and that vaccines contain haram (forbidden) ingredients. Extremist groups have also spread propaganda and threatened people to discourage vaccination efforts. [17,18,19] Similar results were found in the current study. Extremist groups have targeted and even assassinated vaccination officials, hindering vaccination campaigns and allowing the transmission of wild poliovirus.[17,20] The influence of religious leaders and the endorsement of polio vaccination by religious scholars are seen as potential solutions to address these misconceptions and increase acceptance of vaccines.

Misperceptions about the polio vaccine persist and play a significant role in vaccine refusal for both polio and routine immunization. The low confidence in frontline workers and vaccination campaigns, along with complex political and bureaucratic management, local resistance, and insecurity, have hindered vaccination efforts.[21,22] To address these challenges, it is crucial to localize vaccination programs by considering the local environment, improving local ownership, and tailoring efforts to achieve polio eradication goals. The success of the polio program in Pakistan requires collaboration between politicians, community mobilizers, government, public health specialists, and education departments.

The current study has some limitations. Firstly, the data collected relied on self-reported measures through a questionnaire; therefore, recall bias cannot be ignored. Secondly, the cross-sectional design prevents causal relationships between variables, suggesting a need for longitudinal studies. Finally, the potential confounding factors, such as socioeconomic status, cultural beliefs, and access to healthcare services, were not comprehensively addressed, suggesting the need for future research incorporating a broader range of covariates.

Conclusions

A considerable proportion of the respondents showed refusal to polio vaccination. Religious extremism, poor knowledge regarding the disease and joint family system were the significant predictors of vaccine refusal.

Conflict of interest

The authors declare that there is no conflict of interest.

Author's contributions

Hikmat Ullah: conceptualization, statistical analysis, investigation, data curation, writing and original draft preparation, writing-review and editing.

Saima Saman: methodology.

Abdullah Saleh Alruwaili: conceptualization, statistical analysis, investigation, data curation, writing and original draft preparation, writing-review and editing.

Ahmad Alanazy: conceptualization, methodology, statistical analysis, investigation, data curation, writing

and original draft preparation, writing-review and editing.

Hanan Saleh Alruwaili: conceptualization, statistical analysis, investigation, data curation, writing and original draft preparation, writing-review and editing.

Iltaf Hussain: conceptualization, statistical analysis, investigation, data curation, writing and original draft preparation, writing-review and editing.

All authors have read and agreed to the published version of the manuscript.

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Estudio de corte transversal de los factores de rechazo a la vacunación antipoliomielítica

Resumen

La poliomielitis es una enfermedad contagiosa que aún persiste en Pakistán, a pesar de los esfuerzos que se realizan para garantizar una cobertura de vacunación completa, pero, en contrapartida, prevalece el rechazo. El presente estudio se realizó para evaluar factores de rechazo a la vacunación contra la poliomielitis. Se llevó a cabo un estudio de corte transversal, en el distrito tribal de Waziristán del Norte (zona endémica de poliomielitis) entre enero de 2023 y julio de 2023. Los datos se recogieron mediante un cuestionario. Los participantes en el estudio procedían del público en general y se reclutaron mediante muestreo aleatorio simple. Los datos se analizaron con el paquete estadístico para ciencias sociales SPSS. Completaron la encuesta 387participantes, la mayoría de los cuales eran varones (90,7%), vivían en una familia conjunta (87,1%) y tenían estudios primarios (48,3%). La mayoría de los encuestados tenían escasos conocimientos sobre la poliomielitis (58,7%). El extremismo religioso, los escasos conocimientos sobre la enfermedad y la cultura de familia conjunta fueron los factores predictivos significativos del rechazo a la vacunación antipoliomielítica. Este rechazo puede provocar la reaparición de brotes de polio.

Palabras clave: polio; vacunación; rechazo a las vacunas.

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