

Parents' attitude towards pneumococcal vaccine: an online survey from Jordan

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Abstract

Objectives: In developing countries, the pneumococcal conjugate vaccine (PCV) has not been incorporated into the national immunization schedule, and the vaccination rate is low. This study aimed to examine parental knowledge, attitudes, and barriers to children receiving the PCV in Jordan.

Methods: This was a questionnaire-based cross-sectional study. The online survey was written in Arabic and consisted of three main sections. The questionnaire was distributed via social media platforms, such as Facebook, Twitter, and WhatsApp.

Results: In total, 720 responses were analyzed. Only 149 (20.7%) of the parents' children were vaccinated with the PCV. However, almost half 356 (49.4%) of the respondents were willing to vaccinate their children. Most (563, 78.1%) parents stated that the vaccine would protect their children from pneumococcal disease. More than two thirds (516, 71.6%) of them strongly agreed or agreed that the cost of the PCV is high. Parents who had vaccinated their children had a higher monthly income than parents who had not vaccinated their children.

Conclusions: This study shows a lack of knowledge regarding pneumococcal infection and the PCV among Jordanian parents. This is the main barrier to vaccinating children. Therefore, improving parental knowledge would increase the rate of vaccination among Jordanian children.

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Keywords

Pneumococcal infection, vaccine, attitude, prevention, disease, knowledge, pneumococcal conjugate vaccine, social media platform, Jordan

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Introduction

Streptococcus pneumoniae is a major cause of community-acquired pneumonia, meningitis, and sepsis in children, and is the leading cause of mortality due to pneumonia worldwide.^{1,2} The pneumococcal conjugate vaccine (PCV) has reduced the invasive pneumococcal disease burden in children.³ In 2007, the World Health Organization recommended that all participating countries incorporate the PCV into the national immunization schedule.⁴ Despite this recommendation, some countries have still not introduced this vaccine, and just over 50% of the world's population has been fully vaccinated with the PCV.⁵

Despite the efforts of the Jordanian Ministry of Health to include all essential childhood vaccines in the national vaccination program, the PCV has still not been included and is not covered by national health insurance or specific private health insurance.⁶ With regard to vaccines covered in the national program, Jordanian mothers show adequate knowledge, positive attitudes towards vaccination, and high vaccination rates.⁷ In elderly Jordanians who are another at-risk group that should receive a booster dose at 65 years of age, knowledge of pneumococcal disease was reported to be <5%.⁸

Across different populations, certain barriers have been identified towards PCV vaccination. These barriers include a lack of knowledge, lack of communication with the physician, high cost of the

PCV, and others.^{8,9} To the best of our knowledge, there have been no studies focusing on the knowledge and attitudes of the Jordanian population towards pneumococcal disease or the potential barriers towards PCV vaccination. Therefore, we conducted a cross-sectional survey to study parents' attitudes and knowledge towards pneumococcal disease and the PCV, and to identify potential barriers to vaccination in our population.

Methods

Study design and population

This was a questionnaire-based cross-sectional study conducted between October and December 2021. The reporting of this study conforms to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.¹⁰ Our study population consisted of Jordanian parents currently residing in Jordan. The questionnaire was prepared using Google forms. A link to an online questionnaire was distributed via social media platforms, such as Facebook, Twitter, and WhatsApp. Jordanians residing in all 12 governorates were invited to participate.

Questionnaire

The questionnaire was written in an easily understood Arabic language. Initially, the questionnaire was distributed to 30 volunteers as a pilot test to confirm that the questions were easily understood. The

questionnaire was divided into three sections. The first section covered the parents' demographics and whether their children follow the national vaccination program. The second section focused on the parents' awareness and perceived knowledge of pneumococcal disease and the PCV. Questions focused on parents' knowledge about the risk of contracting pneumococcal disease, knowledge of the vaccine for pneumococcal disease, and the availability and price of the vaccine. The third section covered possible barriers to pneumococcal vaccination in parents. The validity of the questionnaire items was determined by a board-certified pediatric pulmonologist. Cronbach's alpha was calculated to assess reliability for the section containing the Likert scale, which included the parents' awareness and perceived knowledge of pneumococcal disease and the PCV. This value was 0.792.

Ethical approval and informed consent

Ethical approval was granted by the Institutional Review Board of Jordan University Hospital (2021/373). This study was performed in accordance with the Declaration of Helsinki. Before the first page of the survey, there was a paragraph explaining the nature of the study and the anonymity of the survey, which contained no identifying information. The parents were free to withdraw from the study whenever they wanted. After the parents provided informed consent, they were allowed to start the survey.

Statistical analysis

IBM SPSS version 28.0 (IBM Corp., Armonk, NY, USA) was used for the statistical analysis. Variability analysis in the form of the mean (\pm standard deviation) was used to describe age. Standard descriptive statistical parameters were calculated for participants' characteristics,

and responses to questions answered along an ordinal five-point Likert scale were reported as counts (frequencies). Percentage values were calculated at the study level. The reliability of the questionnaires was computed via Cronbach's alpha. The chi-square test was used to analyze the relationship between the study parameters. Statistical significance was defined as a p value of <0.05 .

Results

Characteristics of the study population

The characteristics of the parents and children are shown in Table 1. In total, 720 questionnaires that were completed by the parents were included in the analysis. Among the respondents, 149 (20.7%) had children who were already vaccinated, 356 (49.4%) were willing to provide the vaccine to their children, and 215 (29.9%) were not willing to provide the vaccine to their children.

Among the respondents, 508 (70.6%) were mothers, 212 (29.4%) were fathers, and the most represented age group was 30 to 40 years. Most (628, 87.2%) respondents had a higher education, 136 (18.9%) were healthcare workers, and 441 (61.3%) had three or more children. Only 21 (2.8%) had a chronic disease, 31 (4.2%) had a known history of pneumococcal infection, and 694 (96.3%) had been routinely vaccinated under the national immunization program in Jordan. Furthermore, most (599, 83.2%) respondents reside near hospitals that they can reach in 1 hour or less.

Knowledge and attitudes towards the PCV

A high proportion (563, 78.1%) of parents stated that the vaccine would be beneficial and protect their children from pneumococcal disease. However, 80 (11.1%) parents believed that there would not be any long-

Table 1. Characteristics of the parents and their children.

Categories	Total, n (%)	Vaccine status, n (%)			p value
		Already vaccinated (n = 149)	Accept (n = 356)	Refuse (n = 215)	
Parents					
Sex					0.031
Male	212 (29.4)	32 (21.5)	118 (33.1)	62 (28.8)	
Female	508 (70.6)	117 (78.5)	238 (66.9)	153 (71.2)	
Age (years)					0.054
<30	56 (7.8)	13 (8.7)	27 (7.6)	16 (7.4)	
30–40	294 (40.8)	75 (50.3)	143 (40.2)	76 (35.3)	
41–50	269 (37.4)	49 (32.9)	129 (36.2)	91 (42.3)	
>50	101 (14)	12 (8.1)	57 (16)	32 (14.9)	
Area of residence					<0.001
Central	570 (79.2)	136 (91.3)	281 (78.9)	153 (71.2)	
South	91 (12.6)	4 (2.7)	44 (12.4)	43 (20)	
North	59 (8.2)	9 (6)	31 (8.7)	19 (8.8)	
Type of residence					0.007
City	633 (87.9)	144 (96.6)	307 (86.2)	182 (84.7)	
Village	79 (11)	5 (3.4)	44 (12.4)	30 (14)	
Camp	8 (1.1)	0 (0)	5 (1.4)	3 (1.4)	
Education level					<0.001
Primary school	16 (2.2)	1 (0.7)	10 (2.8)	5 (2.3)	
Secondary school	76 (10.6)	8 (5.4)	35 (9.8)	33 (15.3)	
College diploma	89 (12.4)	8 (5.4)	47 (13.2)	34 (15.8)	
Bachelor's degree	397 (55.1)	90 (60.4)	198 (55.6)	109 (50.7)	
Masters or Doctorate degree	142 (19.7)	42 (28.2)	66 (18.5)	34 (15.8)	
Education level of the spouse					<0.001
Primary school	36 (5)	2 (1.3)	21 (5.9)	13 (6)	
Secondary school	111 (15.4)	11 (7.4)	58 (16.3)	42 (19.5)	
College diploma	80 (11.1)	10 (6.7)	42 (11.8)	28 (13)	
Bachelor's degree	351 (48.8)	83 (55.7)	172 (48.3)	96 (44.7)	
Masters or Doctorate degree	142 (19.7)	43 (28.9)	63 (17.7)	36 (16.7)	
Monthly family income in JOD					<0.001
<500	169 (23.5)	13 (8.7)	98 (27.5)	58 (27)	
500–999	208 (28.9)	28 (18.8)	103 (28.9)	77 (35.8)	
1000–1499	111 (15.4)	24 (16.1)	54 (15.2)	33 (15.3)	
1500–2000	80 (11.1)	27 (18.1)	36 (10.1)	17 (7.9)	
>2000	152 (21.1)	57 (38.3)	65 (18.3)	30 (14)	
Occupation					<0.001
HCW	136 (18.9)	53 (35.6)	51 (14.3)	32 (14.9)	
Non-HCW	584 (81.1)	96 (64.4)	305 (85.7)	183 (85.1)	
Number of children					<0.001
1	84 (11.7)	23 (15.4)	38 (10.7)	23 (10.7)	
2	195 (27.1)	55 (36.9)	99 (27.8)	41 (19.1)	
≥3	441 (61.3)	71 (47.7)	219 (61.5)	151 (70.2)	

(continued)

Table 1. Continued.

Categories	Total, n (%)	Vaccine status, n (%)			p value
		Already vaccinated (n = 149)	Accept (n = 356)	Refuse (n = 215)	
Children					
Age (years)	6.99 (5.59)	6.1 (5.75)	6.93 (5.21)	7.7 (5.98)	0.620
History of pneumococcal disease					
Yes, did not need to go to the hospital	8 (1.1)	3 (2)	4 (1.1)	1 (0.5)	
Yes, admitted to hospital	20 (2.8)	5 (3.4)	11 (3.1)	4 (1.9)	
Yes, admitted to the ICU	2 (0.3)	1 (0.7)	1 (0.3)	0 (0)	
No	690 (95.8)	140 (94)	340 (95.5)	210 (97.7)	<0.001
Medical insurance					
None	139 (19.3)	28 (18.8)	65 (18.3)	46 (21.4)	
Ministry of Health	202 (28.1)	17 (11.4)	111 (31.2)	74 (34.4)	
Military insurance	93 (12.9)	12 (8.1)	49 (13.8)	32 (14.9)	
University hospital	34 (4.7)	6 (4)	18 (5.1)	10 (4.7)	
Private insurance	252 (35)	86 (57.7)	113 (31.7)	53 (24.7)	0.294
Chronic disease					
Yes	20 (2.8)	4 (2.7)	7 (2)	9 (4.2)	
No	700 (97.2)	145 (97.3)	349 (98)	206 (95.8)	0.01
Routinely vaccinated under the national program					
Yes	693 (96.3)	142 (95.3)	350 (98.3)	201 (93.5)	
No	27 (3.8)	7 (4.7)	6 (1.7)	14 (6.5)	

Vaccine status groups were defined as follows: *Already vaccinated*, parents who had already allowed their children to receive the pneumococcal conjugate vaccine; *Accept*, parents who were willing to have their children receive the pneumococcal conjugate vaccine; *Refuse*, parents who were not willing to have their children receive the pneumococcal conjugate vaccine.

The p values were calculated by the chi-square test.

1 JOD = 1.41 USD.

JOD, Jordanian Dinar; HCW, healthcare worker; ICU, intensive care unit.

term benefit to the PCV, and 162 (22.5%) stated that, because their child is in good health, he/she does not need the PCV. Table 2 shows the parental knowledge of pneumococcal infection and pneumococcal vaccination according to the vaccine status of their children.

Approximately one third (256, 35.5%) of the parents strongly agreed or agreed that they are concerned about side effects of the PCV on their children, and 77 (10.7%) were concerned that the PCV is too painful for

their children. Furthermore, 152 (21.2%) respondents said that the PCV is not available nearby, and 28 (3.9%) said that they do not have sufficient time to take their child to get the vaccine (Table 3).

Perceived benefits and barriers to PCV vaccination

The primary reasons for parents' willingness to give their children the PCV were, in decreasing order, the necessity of

Table 2. Parental knowledge and perception of pneumococcal disease and pneumococcal vaccination.

Statements	Total, n (%)	Vaccine status, n (%)			p value
		Already vaccinated (n = 149)	Accept (n = 356)	Refuse (n = 215)	
Have you heard of pneumococcal disease?					<0.001
Yes	385 (53.5)	134 (89.9)	168 (47.2)	83 (38.6)	
No	335 (46.5)	15 (10.1)	188 (52.8)	132 (61.4)	
Are children at risk of contracting pneumococcal disease?					<0.001
Yes	328 (45.6)	106 (71.1)	160 (44.9)	62 (28.8)	
No	21 (2.9)	6 (4)	9 (2.5)	6 (2.8)	
I don't know	371 (51.5)	37 (24.8)	187 (52.5)	147 (68.4)	
Are you aware of the PCV?					<0.001
Yes	294 (40.8)	133 (89.3)	116 (32.6)	45 (20.9)	
No	426 (59.2)	16 (10.7)	240 (67.4)	170 (79.1)	
Would you like the PCV to be included in the national immunization program in Jordan?					<0.001
Yes	679 (94.3)	148 (99.3)	352 (98.9)	179 (83.3)	
No	41 (5.7)	1 (0.7)	4 (1.1)	36 (16.7)	

The p values were calculated by the chi-square test for comparison between the statements and the vaccine status. PCV, pneumococcal conjugate vaccine.

Table 3. Parents' perceptions and barriers toward pneumococcal vaccination.

Statements	SD	D	N	A	SA
The vaccine will help protect my child from pneumococcal disease	7 (1)	17 (2.4)	134 (18.6)	364 (50.6)	198 (27.5)
My child is in good health, and he/she does not need the PCV	116 (16.1)	214 (29.7)	228 (31.7)	136 (18.9)	26 (3.6)
The cost of the PCV is high	56 (7.8)	44 (6.1)	105 (14.6)	218 (30.3)	297 (41.3)
I do not have sufficient time to take my child for vaccination	366 (50.8)	255 (35.4)	71 (9.9)	25 (3.5)	3 (0.4)
Vaccination is not available nearby	129 (17.9)	195 (27.1)	244 (33.9)	125 (17.4)	27 (3.8)
The vaccination is too painful for my child	162 (22.5)	215 (29.9)	266 (36.9)	69 (9.6)	8 (1.1)
I fear the side effects of the PCV	108 (15)	162 (22.5)	194 (26.9)	191 (26.5)	65 (9)
There is no long-term benefit of the PCV	118 (16.4)	167 (23.2)	355 (49.3)	61 (8.5)	19 (2.6)

Data shown are n (%).

SA, strongly agree; A, agree; N, neutral; D, disagree; SD, strongly disagree; PCV, pneumococcal conjugate vaccine.

preventing pneumococcal infection (613, 85.1%), reducing the risk of transmission to their children (405, 56.2%), and because the benefits outweighed the adverse effects of the infection (477, 66.2%) (Figure 1). The primary reasons for parents' unwillingness for their children to have the PCV were the lack of a doctor's recommendation (389, 54%), their belief that their child is healthy and

does not require it (533, 76.7%), and a fear of adverse effects (265, 36.7%) (Figure 2).

Cost as a barrier to PCV vaccination

More than two thirds (516, 71.6%) of the parents responded that they strongly agreed or agreed that the cost of PCV is high. Moreover, surprisingly, 449 (62.3%) of those who replied that they were

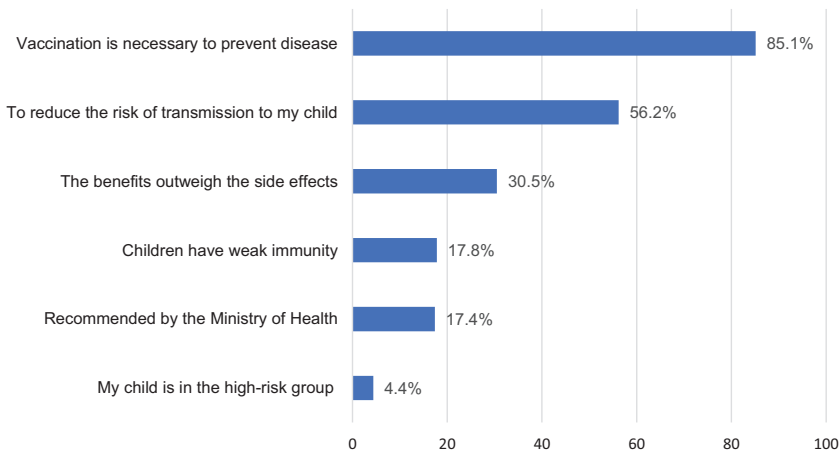


Figure 1. Parents' reasons for willingness to have their children vaccinated for pneumococcal disease (n = 505).

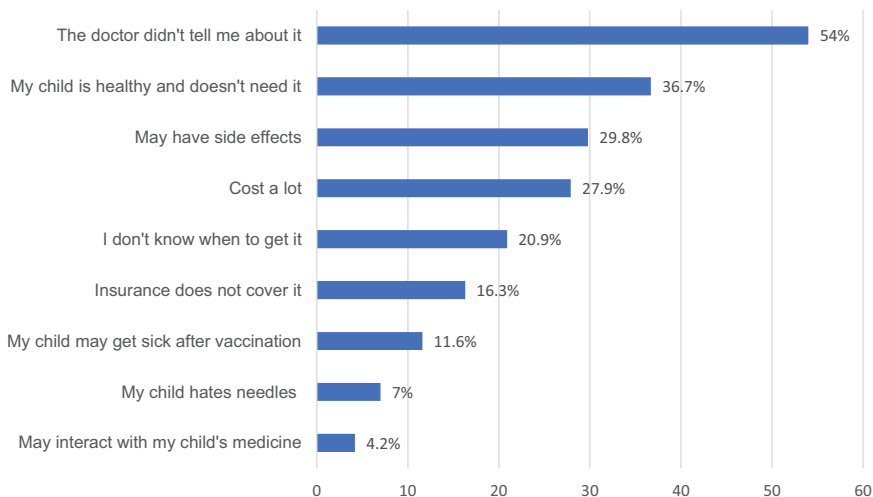


Figure 2. Parents' reasons for not being willing to have their children vaccinated for pneumococcal disease (n = 215).

unwilling to vaccinate their children would allow their children to have the vaccine if it was free. In addition, a high percentage (536, 74.4%) of parents who replied that they are unwilling to vaccinate their children were willing to have the vaccine administered to their children if it was included in Jordan's national vaccination program.

In addition, parents who had vaccinated children had a higher monthly income than parents whose children were not vaccinated (Table 1, $p < 0.001$).

Factors affecting the vaccination of parents' children

There were significant associations in the sex of the parents, area of residence, place of living, educational level of the parents, academic level of the spouse, family income, occupation of a healthcare worker, number of children, medical insurance, and whether parents vaccinated their children routinely under the national program among different vaccine statuses (all $p < 0.05$, Table 1). However, the parents' age, children's history of pneumococcal diagnosis, and children having a chronic disease were not associated with the vaccine status.

Sources of trusted information on the PCV Vaccine

Among the parents unwilling to allow their children to be vaccinated ($n = 215$), acquiring additional information about the PCV and the doctor's recommendation were the most common factors that may have persuaded them to change their minds (463 [64.2%] and 416 [57.7%], respectively). Moreover, 40.9% of the respondents replied that having information from the awareness campaign, followed by 272 (37.7%) who replied that if the vaccine was free or covered by insurance, would

make them consider vaccination of their children. Only 94 (13%) of the parents considered a recommendation from a friend or a family member to vaccinate their children, and 27 (3.7%) might consider vaccination if they read about it on the internet.

Discussion

This study aimed to assess parental knowledge and attitudes towards pneumococcal disease and vaccination of their children. Severe pneumococcal disease is easily preventable with the PCV, but it has not yet been introduced into the national immunization program in Jordan. In our study, 96.3% of the respondents had been completely vaccinated as recommended by the national immunization program. This number was similar to that reported by Masadeh et al.⁷ In our sample, just over half of the respondents had heard of pneumococcal disease, and only 4.2% had reported a previously known pneumococcal infection. Furthermore, half of the parents did not know if children were at risk of contracting pneumococcal disease. These findings indicate that parental awareness of pneumococcal disease is not optimal. Awareness of pneumococcal infection was less in parents who refused to allow their children to get vaccinated. Among those who refused vaccination, only approximately 40% had heard of pneumococcal disease, and almost 70% did not know if their children were at risk of contracting pneumococcal infection. These findings are similar to other studies. How et al. reported that more parents in the unvaccinated group had not previously heard of pneumococcal disease, and they did not perceive it as a threat as much as the vaccinated group.⁹

Similar to the above-mentioned studies, the awareness of PCV in our sample was not optimal. While the majority of patients believed that the vaccine would be beneficial, only 41% had previously known about

the vaccine. This number decreased in those who refused the vaccine. The majority of parents reported that they would like the PCV to be included in the national immunization program. However, this rate was less in those who refused the vaccine than in those who accepted the vaccine. Interestingly, some Jordanians already believed that the PCV was part of the program. Similarly, Masadeh et al. reported that almost 20% of their participants thought that the PCV was included.⁷ The rate of the PCV vaccination internationally is not high across different populations. A report on Italian children with chronic medical conditions showed that less than 25% of them had the PCV.¹¹

Parents are the decision-makers regarding whether their children receive vaccines. This study showed that the main reasons for parents to vaccinate their children was to prevent them from getting pneumococcal infection and decrease the risk of its transmission. Moreover, the benefits of the vaccination exceeding its side effects was another reason why children received the PCV in Jordan. However, a main reason for not getting vaccinated in Singapore was that parents perceive less benefit from the vaccine.⁹ In this study, one of the main reasons parents were unwilling to allow their children to receive the PCV was the lack of advice from healthcare professionals, which indicates the importance of the healthcare sector in spreading awareness and knowledge about the PCV worldwide. This finding is inconsistent with previous studies in Singapore and Bangladesh.^{9,12} Furthermore, the belief that the parents' healthy child did not need the PCV, in addition to their concerns regarding the side effects of the PCV, played a major role in this study and in the study from Singapore. Additionally, in Sri Lanka, maternal knowledge of immunization affected their children's vaccination status, which is in agreement with this study's findings.⁹

A total of 95% of the National Vaccination Program in Jordan, which provides all children with vaccines against 11 diseases, is administered free of charge.⁷ However, the PCV is not yet covered in this program. In this study, a high percentage of parents who were unwilling to vaccinate their children would be willing to vaccinate them if it was included in the cost-free program. Cost was a major barrier to vaccination with the PCV in Jordan and in other countries such as Singapore. There was a strong agreement among parents in this study that the PCV is expensive. Surprisingly, more than two thirds of parents who were unwilling to vaccinate their children would allow their children to be vaccinated if the PCV was free.⁸ Furthermore, a survey in the USA asked pediatricians about their willingness to pay for the PCV out of pocket and showed the presence of a significant financial barrier, especially among a profession with knowledge of pneumococcal risk.¹³ In India, approximately two thirds of pediatricians recommend PCV to their patients, and the majority of them claim that patients do not follow the pediatrician's advice because of the high cost of the PCV.¹⁴ In Japan, where the PCV is voluntary and partially covered by the government, parents cited financial burdens as the main cause for the significantly lower vaccination rates of the PCV than mandatory vaccines.¹⁵ Therefore, these findings indicate a financial barrier, and the necessity to include the PCV in the National Vaccination Program for the health and well-being of children to build herd immunity in the Jordanian community.

In our study, there were some factors that were associated with the vaccination status, such as the area of residence, educational level, family income, healthcare workers in the family, and insurance. These findings are similar to those in other studies, where important socio-

economic factors, such as education and income, were associated with the vaccination status for other vaccines.^{16,17}

With regard to parents who refused to allow their children to take the vaccine, the most common reason for their unwillingness was that they were not told about the PCV by their physician. Factor that would change their minds included additional information about PCV and getting recommendations from their physicians. Ucakar et al. reported that, in most parent groups, including those who were undecided on vaccines, physicians were the most trusted source of information.¹⁸ However, in the group where there was no confidence in vaccines, friends were reported as their source of trusted information.¹⁸ In countries with high vaccination rates, such as Jordan, increasing communication between physicians and their patients is likely to lead to a higher vaccination status, not accounting for other important barriers such as the cost.

This lack of awareness is also found in the other higher-risk populations, such as elderly patients. In Jordan, the awareness of pneumococcal disease in elderly people is <5%, and the vaccination rate is <1%.⁸ The main barriers to vaccination in elderly people are a negative attitude toward the vaccine and a lack of recommendation by their physician.⁸ These factors are of international concern, with similar findings in multiple European countries¹⁹ and the USA.²⁰

Limitations to our study include sampling using social media platforms, which may have limited access to certain population areas and led to possible misrepresentation and homogeneity of the sample. However, our sample size was calculated and considered adequate. Our data were collected at one point in time, and further studies with more time points are required to address this issue. Furthermore, only a minority of our population had not

received a higher degree of education, which could have skewed our results.

Conclusion

This study shows a deficiency in knowledge and attitudes towards pneumococcal disease and the PCV, as well as barriers that could possibly be managed systematically. A large percentage of parents with unvaccinated children are willing to allow their children to be vaccinated if the previously mentioned barriers are overcome. Cost is an important barrier, as shown by our results and other studies, especially in a developing country such as Jordan, and alleviating this cost could decrease the disease burden. Incorporating the PCV into the national immunization schedule would increase the rate of vaccination among Jordanian children.

Author contributions

M.A. conceived the idea of the research, designed and supervised the study, and critically reviewed the manuscript. A.K. collected the data and helped write the first draft of the manuscript. M.A.A. designed the study and analyzed the data. M.I.A. helped collect the data and wrote the first draft of the manuscript. T.H. collected the data and helped write the first draft of the manuscript. O.K. and Z.A. helped collect the data and critically reviewed the final manuscript. S.A. designed the study, helped interpret the data, and critically reviewed the manuscript. All authors read and approved the final manuscript.

Data availability

The dataset for this paper is available upon request.


Declaration of conflicting interests

The authors declare that there is no conflict of interest

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References

- Dion CF, Ashurst JV. Streptococcus pneumoniae, <https://europepmc.org/books/nbk470537> (2017, Accessed 20 June 2022).
- Pneumonia, <https://www.who.int/news-room/fact-sheets/detail/pneumonia> (Accessed 3 May 2022).
- Izurieta P, Bahety P, Adegbola R, et al. Public health impact of pneumococcal conjugate vaccine infant immunization programs: assessment of invasive pneumococcal disease burden and serotype distribution. *Expert Rev Vaccines* 2018; 17: 479–493. Available from: <http://dx.doi.org/10.1080/14760584.2018.1413354>
- Pneumococcal conjugate vaccine for childhood immunization—WHO position paper. *Wkly Epidemiol Rec* 2007; 82: 93–104. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/17380597>
- Muhoza P, Carolina Danovaro-Holliday M, Diallo MS, et al. Routine Vaccination Coverage — Worldwide, 2020 [Internet]. Vol. 70, MMWR. Morbidity and Mortality Weekly Report. 2021. p. 1495–500. Available from: <http://dx.doi.org/10.15585/mmwr.mm7043a1>
- جدول مطاعيم الأطفال في الأردن https://tebcn.com/ar/All/tebline/Admin/_أطفال_وحديثي_أطفال_جدول_مطاعيم_الأطفال_في_الأردن_32_الأردن (Accessed 4 May 2022).
- Masadeh MM, Alzoubi KH, Al-Azzam SI, et al. Public awareness regarding children vaccination in Jordan. *Hum Vaccin Immunother* 2014; 10: 1762–1766. Available from: <http://dx.doi.org/10.4161/hv.28608>
- Abu-Rish EY and Barakat NA. The impact of pharmacist-led educational intervention on pneumococcal vaccine awareness and acceptance among elderly in Jordan. *Hum Vaccin Immunother* 2021; 17: 1181–1189. Available from: <http://dx.doi.org/10.1080/21645515.2020.1802973>
- How C, How CH, Chun PPS, et al. Parental knowledge, attitudes and perception of pneumococcal disease and pneumococcal conjugate vaccines in Singapore: a questionnaire-based assessment. *BMC Public Health* 2016; 16: 923. Available from: <http://dx.doi.org/10.1186/s12889-016-3597-5>
- Erik Elm, Altman, Egger, Pocock. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Intern Med* [Internet]. Available from: <http://www.protonet.org/docs/strobe.pdf>
- Giannattasio A, Squeglia V, Lo Vecchio A, et al. Pneumococcal and influenza vaccination rates and their determinants in children with chronic medical conditions. *Ital J Pediatr* 2010; 36: 28. Available from: <http://dx.doi.org/10.1186/1824-7288-36-28>
- Luies SK, Hossain MT and Sarma H. Awareness among parents about pneumococcal conjugate vaccine in routine immunization program to prevent pneumococcal pneumonia in Bangladesh. *Cureus* 2019; 11: e6082. Available from: <http://dx.doi.org/10.7759/cureus.6082>
- Lieu TA, Finkelstein JA, Adams MM, et al. Pediatricians' views on financial barriers and values for pneumococcal vaccine for children. *Ambul Pediatr* 2002; 2: 358–366. Available from: [http://dx.doi.org/10.1367/1539-4409\(2002\)002<0358:pvoeba>2.0.co;2](http://dx.doi.org/10.1367/1539-4409(2002)002<0358:pvoeba>2.0.co;2)
- Zodpey S, Farooqui HH, Chokshi M, et al. Pediatricians' perspectives on pneumococcal conjugate vaccines: an exploratory study in the private sector. *Indian J Public Health* 2015; 59: 225–229. Available from: <http://dx.doi.org/10.4103/0019-557X.164667>
- Tsuda Y, Watanabe M, Tanimoto Y, et al. The current situation of voluntary vaccination and the factors influencing its coverage

- among children in Takatsuki, Japan: focus on Hib and pneumococcal vaccines. *Asia Pac J Public Health* 2015; 27: NP1409–NP1420. Available from: <http://dx.doi.org/10.1177/1010539513487013>
16. Mogoi D, Muchiri EM and Mutuma AM. Vaccine coverage of newly introduced vaccines and factors influencing among children less than 23 months in Laikipia north sub-county. *Open J Prev Med* 2020; 10: 9–43. Available from: <https://www.scirp.org/journal/doi.aspx?doi=10.4236/ojpm.2020.102002>
 17. Ntenda PAM. Factors associated with non- and under-vaccination among children aged 12–23 months in Malawi. A multinomial analysis of the population-based sample. *Pediatr Neonatol* 2019; 60: 623–633. Available from: <http://dx.doi.org/10.1016/j.pedneo.2019.03.005>
 18. Učakar V, Fafangel M and Kraigher A. Vaccine confidence among mothers of young children, Slovenia, 2016. *Vaccine* 2018; 36: 5544–5550. Available from: <http://dx.doi.org/10.1016/j.vaccine.2018.07.062>
 19. Lode H, Ludwig E and Kassianos G. Pneumococcal infection—low awareness as a potential barrier to vaccination: results of a European study. *Adv Ther* 2013; 30: 387–405. Available from: <http://link.springer.com/10.1007/s12325-013-0025-4>
 20. Nowalk MP, Zimmerman RK, Shen S, et al. Barriers to pneumococcal and influenza vaccination in older community-dwelling adults (2000–2001). *J Am Geriatr Soc* 2004; 52: 25–30. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1532-5415.2004.52006.x>