

Awareness of Childhood Immunization among Well Baby Clinic Attendees in Al Ahsa, Saudi Arabia: A Cross-Sectional Study

Latifah Ahmed Albash¹, Hajar Shaher Almubaireek², Aminah RahilAlmatrafi³,
Mohammed Abdulrahman Aljamaan⁴, Faiy Fahad Almulhim⁵

Family Medicine Department, King Abdulaziz Hospital, Al Ahsa Saudi Arabia

Abstract: *Essential childhood immunization plays an important role in preventive medicine, as they can help people live healthier lives and reduce medical costs. According to the Centers for Disease Control and Prevention, vaccinations have prevented more than 21 million hospitalizations and 730,000 deaths in children over the last 20 years. This cross-sectional study aimed to assess the level of parental awareness regarding childhood immunization, measure the prevalence of children who had received all essential vaccinations, and determine the factors related to immunization delays and hesitancy. Participants were 387 parents who attended a well-baby clinic at King Abdul-Aziz Hospital with their children for essential vaccinations between August and October 2020. Overall, 88.6% of the participants' children received essential vaccines regularly before the age of one (61.2%). Reasons for low compliance included the child being healthy (45.2%) and vaccines being "unimportant" (25.6%). Parents with bachelor's degrees or higher had significantly better knowledge of immunization than others, while mothers with bachelor's degrees or higher showed significantly better attitude scores. Although parents' perceived attitudes toward childhood immunization were adequate, their knowledge requires improvement. Parents with higher education levels demonstrated better knowledge of and attitudes toward childhood immunization.*

Keywords: Childhood immunization, parents, awareness, well-baby clinic

1. Introduction

Childhood essential immunization is playing an important role in preventive medicine which can help people to live healthier and keep medical costs down. According to the Centers for Disease Control and Prevention (CDC), the vaccinations prevent more than 21 million hospitalizations and 730,000 deaths among children in the last 20 years. Also, it is found that every 1 dollar spent in vaccines in the U.S. saves about 10 dollars in medical cost.¹

Worldwide in 2018, the estimated number of children had not reached with basic routine vaccinations was 19.4 million infants.² The American Academy of Family Physicians (AAFP) agrees to the concept that all children and adults should have access to all recommended vaccinations regardless of their economic and insurance status to continue having all the advantages of vaccinations.¹

In Saudi Arabia, the estimated percentage of children who had completed their routine vaccinations was 84.8% in the 1st year of life and 91.9% in the 2nd year of life. While the percentage of children who had partially vaccinated was 6-18%, and only 0-8% who had not received any vaccinations.³

In previous few years, the physicians in Saudi Arabia were having a large number of parents who are asking about the safety and necessity of childhood immunization due to misconceptions about the vaccinations. The parent awareness regarding the basic vaccinations was mainly from medical staff, followed by social media and books. Almost half of parents had enough knowledge about child vaccinations and more than half of parents had a positive attitude towards child vaccinations. Majority of the parents (57%) have high compliance with Ministry Of Health

(MOH) vaccinations schedule in Saudi Arabia and they are agreed that the received vaccinations enhance child's immunity against infectious diseases while 43% of them are disagreed.⁴

The Expanded Program on Immunization (EPI) is released by World Health Organization (WHO) in 1974 and aimed for a universal immunization of children against tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, and measles. By 1990, the percentage of children worldwide who received these six vaccines was about 80% due to EPI efforts. The current immunization schedule that was enacted in 1991 was a product of efforts made by the MOH in collaboration with several major hospitals in the Kingdom in order to unify this practice.⁵

Delaying receiving of essential childhood immunization includes some factors; accessibility to health care setting and availability of medical appointments, healthy status of child in the vaccination day, working mother and higher maternal educational level which is significantly associated with delayed vaccinations. Sometimes, the delay is based on physician's advice or vaccines are partially or totally contraindicated. In general, negative beliefs toward vaccination also seemed to be associated with increase hesitancy and incomplete vaccination status of children.⁶⁻⁸

Our aim of this study to assess the awareness level of parents about childhood immunization and to measure of prevalence of childhood immunization completeness as well as to determine the related factors of immunization delaying and hesitancy.

2. Materials and Methods

A cross sectional Study was conducted in King Abdul-Aziz Hospital (KAH) for National Guard Al Ahsa – Primary Health Care (PHC) during December 2019 to December 2020.

The study included the Children who attend well baby clinic (WBC) in PHC for children essential vaccinations. Children who had precautions or contraindicated for receiving any vaccine due to clinical concern was excluded.

One Qualitative outcome equation for sample size calculation was used assuming that 95% CI and 5% margin of error. There were about 57% of Parents in Saudi Arabia believed that compliance with MOH vaccination schedule is very important.⁴ The minimum required sample size to achieve this percentage is 377 children (See equation).

$$SS = (Z_{\alpha})^2 (P)(1-P) / e^2$$

$$= (1.96)^2 (0.57)(0.43) / (0.05)^2$$

We used in the study a systematic random sample technique. Based on the daily patients list in BESTCARE system, every second patient will be selected and included. WBC (well baby clinic) has ten booked sessions per week including about 15 children per session and it is covered by Family Medicine Physician with one staff Nurse. As per PHC regulation, all children had to be screened by Nurse and seen by Physician in WBC before receiving the essential vaccinations. During the visit, study consent form and questionnaire was distributed from designated Nurse in WBC during patients' registration and activation. Parents or relatives filled the questionnaire in the waiting area and submitted it to the designated Nurse who was trained to answer any concern or query related to study.

Data collection method includes self-administered questionnaire and chart medical review. Questionnaire was modified from one previous study⁸ in addition to some other relevant studies.^{6-7, 14} Questionnaire includes four sections; Child's general characteristics, Compliance for essential childhood immunization, Parent's awareness toward essential childhood immunization (Knowledge and attitude) and Medical chart review which will be filled by study Investigators.

Study questionnaire was validated and modified through review of three experts in Family Medicine practice and Biostatistician. As well, electronic WBC form in BESTCARE Electronic Health Information system (e-HIS) was revised to ensure the available data in the medical charts. Pilot study was conducted to validate assess the validity and measure the reliability of Parent's awareness (Knowledge and attitude) questions.

Study questionnaire was translated to Arabic using Google translate website and it was retranslated back to English by external investigator. Then, it was compared to the original

copy and modified accordingly. Study investigator will supervise the mentioned process and ensure the proper implementation.

Every participant was coded based on year of admission and serial number in patients' admission book. Data was entered into a personal computer using SPSS Software. Missing data was handled. Descriptive statistical analysis is through calculation of mean and standard deviation for continuous variables with proportion for nominal variables. In inferential statistical analysis, significant result was represented by P value of less than 5% and 95% confidence interval "inferential statistics". Chi-square test for categorical variables and Student T test for continuous variables was used as bivariate analysis followed by multivariable analysis with finding out the adjusted effective measure if needed.

3. Statistical Analysis

Descriptive statistics are presented as numbers, percentages, means, and standard deviations whenever appropriate. Parental knowledge of the importance of childhood immunization was measured using a six-item questionnaire (discussed in Table 2), where "yes" was coded as 1 and "no/I don't know" was coded as 0. The total knowledge score was calculated by adding all six items, and a score ranging from 0 to 6 was generated; the higher the score, the higher the knowledge of the importance of childhood immunization. Knowledge scores were divided into two categories: scores from 0 to 3 indicated poor knowledge, and scores from 4 to 6 indicated good knowledge.

Attitude toward the essence of childhood immunization was assessed using a 9-item questionnaire (discussed in Table 2) rated on a 5-point Likert scale ("strongly disagree" = 1; "strongly agree" = 5). The total attitude score was calculated by adding all nine items and ranged from 9 to 45; the higher the score, the higher the attitude toward the essence of childhood immunization. By using 60% as a cutoff point to determine the attitude level, participants were classified as having a negative attitude if their score was less than or equal to 60%, or a positive attitude if their score was above 60%.

Knowledge and attitude scores were compared to the parents' socio-demographic characteristics using the Mann-Whitney Z-test. Normality tests were conducted using the Shapiro-Wilk and Kolmogorov-Smirnov tests. The data exhibited an abnormal distribution; therefore, nonparametric tests were performed. A correlation procedure was also performed to determine the linear agreement between the knowledge scores and attitudes. A two-tailed analysis ($p < 0.05$) was used as the cutoff for statistical significance. All data analyses were performed using the Statistical Package for Social Sciences version 26 (SPSS, Armonk, NY, USA).

4. Results

Table 1: Sociodemographic characteristics of the children and parents (n=387)

| Study Data | N (%) |
|--|-------------|
| Age group | |
| • ≤1 year | 272 (70.3%) |
| • >1 year | 115 (29.7%) |
| Gender | |
| • Male | 205 (53.0%) |
| • Female | 182 (47.0%) |
| Father's Educational level | |
| • Secondary School or below | 264 (68.2%) |
| • Bachelor's degree or higher | 123 (31.8%) |
| Mother's educational level | |
| • Secondary School or below | 196 (50.6%) |
| • Bachelor's degree or higher | 191 (49.4%) |
| Previous history of chronic disease | |
| • Yes | 28 (07.2%) |
| • No | 359 (92.8%) |
| History of any precaution or contraindications for receiving any vaccine | |
| • Yes | 02 (0.50%) |
| • No | 385 (99.5%) |
| Current feeding type | |
| • Exclusive breastfeeding | 47 (12.1%) |
| • Exclusive Bottle feeding | 225 (58.1%) |
| • Both | 73 (18.9%) |
| • Child >2years | 42 (10.9%) |
| Did the child receive all previous essential vaccines regularly? | |
| • Yes | 343 (88.6%) |
| • No | 44 (11.4%) |
| Select which vaccines the child received this visit | |
| • <1 year | 237 (61.2%) |
| • ≥1 year | 150 (38.8%) |
| Do you attend the well baby clinic appointments regularly? | |
| • Yes | 343 (88.6%) |
| • No | 44 (11.4%) |
| Are you satisfied with the essential childhood immunization? | |
| • Yes | 383 (99.0%) |
| • Maybe | 02 (0.50%) |
| • No | 02 (0.50%) |
| Child BMI | |
| • Underweight (<5 th percentile) | 19 (04.9%) |
| • Normal (5 th – <85 th percentile) | 310 (80.1%) |
| • Overweight (85 th – 95 th percentile) | 40 (10.3%) |
| • Obese (>95 th percentile) | 18 (04.7%) |
| Vital signs | |
| • Stable | 384 (99.2%) |
| • Unstable | 03 (0.80%) |
| Development | |
| • Normal | 378 (97.7%) |
| • Delayed | 09 (02.3%) |
| Delayed vaccination | |
| • Yes | 07 (01.8%) |
| • No | 380 (98.2%) |

In total, 387 parents completed the survey. Table 1 presents the socio- demographic characteristics of the parents and their children. Most of the children were aged 1 year or younger (70.3%), and 53% were male. Overall, 68.2% of fathers and 50.6% of mothers listed “secondary school and below” as their highest level of education. A previous history of chronic disease was reported in 7.2% of the children, while a history of precautions or contraindications for vaccination was identified in two cases. Bottle-feeding was the dominant type of feeding (58.1%). Nearly 90% of the respondents indicated that their child had received all

previous essential vaccines, and 61.2% of participants' children had received one of the most important vaccinations before turning one. Parents who regularly attended appointments at the well-baby clinic comprised 88.6% of the sample. The proportion of parents satisfied with the essential childhood immunizations was 99%. Regarding child BMI, 80.1% were normal, whereas only 10.3% were overweight. Most babies had stable vital signs (97.7%), with only 2.3% experiencing delayed birth and 1.8% having delayed vaccinations.

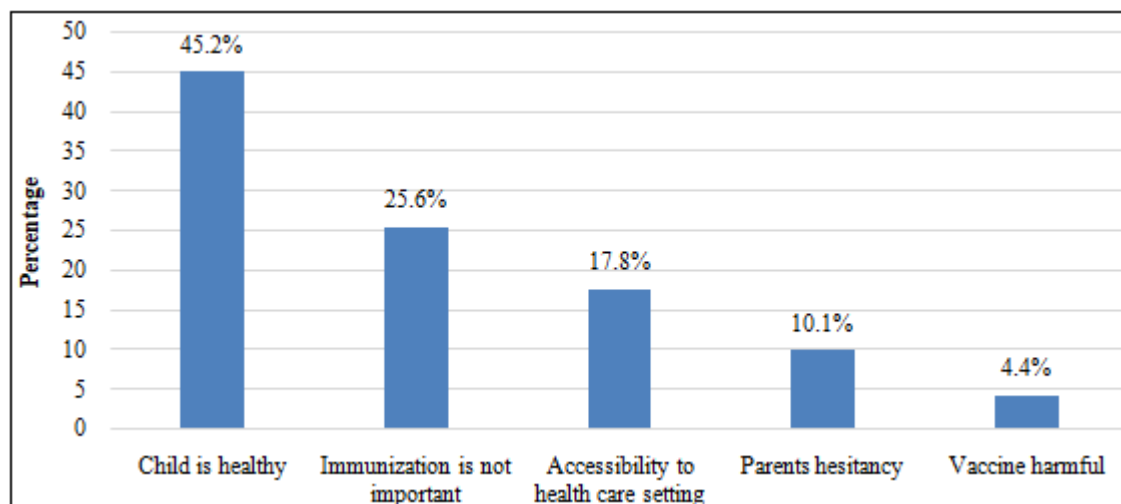


Figure 1: Reasons for low compliance regarding childhood immunization

As shown in Figure 1, the most common reasons for low compliance were that the child was healthy (45.2%) and that immunization is not important (25.6%).

Table 2: Parents' knowledge and attitudes toward essential childhood immunization (n=387)

| Knowledge statements | Yes (%) |
|---|--------------------|
| 1. Vaccines work with your child's immune system to prevent various serious infectious diseases | 358 (92.5%) |
| 2. If you delay, skip, or reject all or some vaccines, there can be risks | 316 (81.7%) |
| 3. Most diseases against which children are vaccinated occur during the first years of life | 278 (71.8%) |
| 4. Multi-doses of the same vaccine given at intervals are important for child immunity | 266 (68.7%) |
| 5. Common colds, ear infections, and diarrhea are not contraindications for vaccination | 100 (25.8%) |
| 6. Immunization can cause autism | 23 (05.9%) |
| Total knowledge score (mean ± SD) | 3.47 ± 1.27 |
| Level of knowledge | |
| • Poor | 185 (47.8%) |
| • Good | 202 (52.2%) |
| Attitude statements | |
| | Mean ± SD |
| 1. Childhood immunization is important | 4.84 ± 0.45 |
| 2. Compliance with the immunization schedule is important | 4.79 ± 0.53 |
| 3. Immunization keeps your child healthy | 4.74 ± 0.53 |
| 4. Vaccines for childhood immunization are safe | 4.64 ± 0.68 |
| 5. Immunization is more beneficial than harmful | 4.56 ± 0.84 |
| 6. Children can become infected after immunization | 3.87 ± 1.12 |
| 7. I am currently hesitant about essential childhood immunization | 3.82 ± 1.22 |
| 8. Immunization is associated with side effects | 3.39 ± 1.20 |
| 9. Childhood immunization is prohibited by my religion | 1.89 ± 1.12 |
| Total attitude score (mean ± SD) | 36.6 ± 3.20 |
| Level of attitude | |
| • Negative | 04 (01.0%) |
| • Positive | 383 (99.0%) |

Table 2 shows the assessment of parents' knowledge and attitudes toward essential childhood immunization. The results revealed that 92.5% of parents knew that vaccines work with the child's immune system to prevent serious infectious diseases and 71.8% were sure that most diseases against which children are vaccinated occur during the first year of life. A total of 81.7% were sure that delaying, skipping, or rejecting all vaccines entirely was risky, and 68.7% were aware that multiple doses of the same vaccine given at intervals were important for child immunity. A total of 25.8% acknowledged that common colds, ear infections, and diarrhea were not contraindications for vaccination. Only 5.9% believed that certain immunizations could cause

autism. The overall mean knowledge score was 3.47 (SD, 1.27), with 52.2% and 47.8% of parents showing good and poor knowledge levels, respectively. Regarding the assessment of attitude, higher agreement with attitude has been noted for the following statements: "Childhood immunization is important" (mean score: 4.84), "Compliance with the immunization schedule is important" (mean score:4.79), and "Immunization keeps your child healthy" (mean score:4.74). The overall mean attitude score was 36.6 (SD 3.20), with nearly all participants classified as having a positive attitude (99%) and only 1% as having a negative attitude.

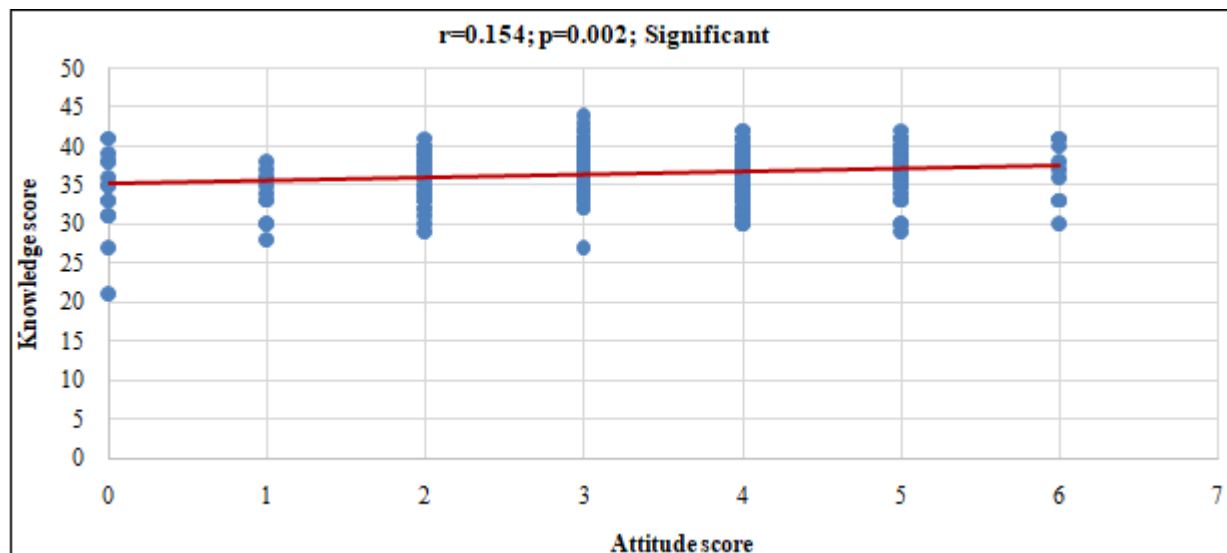


Figure 2: Correlation (Pearson-r) between parents' knowledge and attitude scores

As shown in Figure 2, a significant positive correlation was observed between parents' knowledge and attitude scores ($r=0.154$; $p=0.002$).

Table 3: Differences in parents' knowledge and attitude scores in relation to their socio-demographic characteristics (n=387)

| Factor | Knowledge Score (6) Mean \pm SD | Z-test; P-value | Attitude Score (45) Mean \pm SD | Z-test; P-value |
|--|--------------------------------------|---------------------------|--------------------------------------|---------------------------|
| Father's Educational level | | | | |
| • Secondary school or below | 3.34 \pm 1.30 | 2.743; 0.006 ** | 36.4 \pm 3.21 | 1.258; 0.208 |
| • Bachelor's degree or higher | 3.72 \pm 1.15 | | 36.8 \pm 3.18 | |
| Mother's educational level | | | | |
| • Secondary school or below | 3.32 \pm 1.34 | 2.284; 0.022 ** | 36.2 \pm 3.04 | 2.686; 0.007 ** |
| • Bachelor's degree or higher | 3.61 \pm 1.18 | | 36.9 \pm 3.32 | |
| Previous history of chronic disease | | | | |
| • Yes | 3.36 \pm 1.06 | 0.994; 0.320 | 37.0 \pm 3.32 | 0.953; 0.341 |
| • No | 3.47 \pm 1.28 | | 36.5 \pm 3.19 | |
| Regular appointments with the well-baby clinic | | | | |
| • Yes | 3.45 \pm 1.26 | 0.846; 0.398 | 36.6 \pm 3.20 | 1.127; 0.260 |
| • No | 3.70 \pm 1.42 | | 35.8 \pm 3.16 | |
| Reasons for low compliance* | | | | |
| • Vaccines are harmful | 3.76 \pm 1.30 | 0.603; 0.547 | 37.5 \pm 2.89 | 1.158; 0.247 |
| • Child is healthy | 3.49 \pm 1.16 | 0.112; 0.911 | 36.6 \pm 3.21 | 0.448; 0.654 |
| • Accessibility to healthcare setting | 3.45 \pm 1.22 | 0.240; 0.811 | 36.3 \pm 3.34 | 0.660; 0.509 |
| • Immunization is not important | 3.45 \pm 1.39 | 0.154; 0.878 | 36.3 \pm 3.50 | 0.590; 0.555 |
| • Patients' hesitancy | 3.51 \pm 1.17 | 0.027; 0.979 | 36.7 \pm 3.06 | 0.324; 0.746 |

* Variables with multiple responses.

§ P-value has been calculated using Mann Whitney Z-test.

** Significant at $p < 0.05$ level.

As shown in Table 3, fathers with a bachelor's degree or higher ($Z=2.743$; $p=0.006$) had a significantly higher knowledge score, while mothers with a bachelor's degree or higher had significantly higher knowledge ($Z=2.284$; $p=0.022$) and attitude scores ($Z=2.686$; $p=0.007$). The other variables in the table were not significantly different between the groups ($p > 0.05$).

5. Discussion

This study aimed to determine parents' level of knowledge and attitudes toward childhood immunization. Parents' knowledge of childhood immunization was moderate. Among the 387 parents, 52.2% demonstrated good

knowledge, whereas 47.8% demonstrated poor knowledge (mean score 3.47/6 points). Several papers reported good parental knowledge of childhood immunization.^{4,6-8, 15-17} However, Ahmed et al.¹⁸ reported that mothers had low literacy levels regarding childhood immunization, and that some mothers were unaware of the diseases for which their children were being immunized. We noticed that parents with bachelor's degrees or higher exhibited better knowledge of childhood immunization than others. This is consistent with the findings of Al-Lela et al.,¹⁶ who found significant associations between knowledge and practice groups and fathers' and mothers' education levels.

Moreover, most parents (92.5%) knew that vaccines work with the child's immune system to block infectious diseases

that could be detrimental to their health. Meanwhile, only a few respondents (5.9%) believed that vaccines could cause autism. These findings are strikingly similar to those of Alshamari et al.,⁶ who found that 93% of participants knew that routine vaccination protects children from infectious diseases and related complications, and less than 10% believed that immunization can cause autism. Similarly, Alruwaili et al.⁷ indicated that 88.3% of parents were sure that vaccinations were important for their children and 85.6% believed that vaccinations reduced the number of infectious diseases. Conversely, we found that more than 80 percent were aware that there was a large possibility that the risk increased for delaying, skipping, or rejecting vaccinations, whereas nearly three-quarters (71.8%) believed that most diseases would occur during the early stages of a child's life. In addition, approximately 69% believed that multi-dose vaccinations administered at appropriate intervals were necessary for their children to achieve immunity, while only one-quarter (25.8%) were confident that contraindications for vaccination did not include common colds, ear infections, and diarrhea.

In our further assessment, we found that parents' attitudes fared better than their knowledge. Nearly all of the respondents (99%) exhibited positive attitudes toward childhood immunization. Several studies have consistently documented favorable attitudes toward childhood immunization, varying from 55% to 89.1%.^{4,8,15,17} However, parents in the study by Alshammari et al.⁶ were less optimistic about childhood immunization, with only 43.6% displaying a positive attitude toward the subject. They further revealed a significant relationship between attitudes toward and knowledge of childhood immunization. In our study, we also found a significant positive correlation between knowledge and attitude scores, which indicates that an increase in parents' knowledge is correlated with an increase in their attitude. We also noted that mothers with higher education levels showed better attitudes toward childhood immunization. Contrary to this report, Gebre Eyesus et al.¹⁷ indicated that parents who attended primary and secondary schools had more positive attitudes toward childhood immunizations.

One of the highlights of this study was the optimistic attitudes of parents toward immunization. Accordingly, based on various determinants of attitude, most agreed that childhood immunization was important and that compliance with the immunization schedule was necessary to keep the child healthy. Similarly, most parents were optimistic that childhood immunization would be safe and provide more benefits than harm. In Al Madinah, Saudi Arabia, researchers⁴ documented that most parents believed that compliance with the MOH vaccination schedule was very important. This had also been reported by Alshammari et al.,⁶ who found that most parents (93%) considered adherence to the immunization schedule to be important, while 91% acknowledged that immunization keeps their children healthy. In contrast, Ahmed et al.¹⁸ revealed that mothers' adherence to childhood immunization schedules was poor, as many mothers did not regularly come to vaccinate their children. Consequently, they missed their due vaccination dates. Incidentally, the respondents in our study did not believe that childhood immunization is prohibited by

religion, which is consistent with a study conducted in Riyadh, Saudi Arabia.⁶

Noncompliance with childhood immunization is tantamount to poor perception. In our study, the main reasons for low compliance were "the child is healthy" (45.2%), followed by "immunization is not important" (25.6%) and "hospital accessibility" (17.8%). In a study by Giambi et al.,¹¹ the main reported reason for immunization refusal was child safety. However, most parents considered vaccination an important prevention tool and trusted their family pediatricians, suggesting that they could benefit from appropriate communication interventions.

6. Conclusion

While parents' perceived attitudes toward childhood immunization were adequate, their knowledge needs improvement. Parents with higher education levels demonstrated better knowledge of and attitudes toward childhood immunization. The delivery of childhood immunization education should be focused more on parents with lower education levels. Healthcare professionals play a significant role in providing education on the importance of childhood immunization. Improved communication between healthcare providers and parents can play an important role in facilitating better adherence to childhood immunizations.

7. Future Scope

There are several limitations to the generalizability of this study. First, the study variables did not include some important parental socio-demographic characteristics, such as age, gender, employment status, and monthly income. These factors would have had a greater impact if they had been included in the statistical tests. For instance, we could determine who had better knowledge and attitude when comparing younger vs. older parents, male vs. female parents, unemployed vs. employed parents, or those with higher vs. lower monthly income status. Second, our target population were only attendees of a well-baby clinic, which had a limited sample size; therefore, it may have been better to include parents of infants from other pediatric clinics. Third, a questionnaire-based survey without face-to-face interviews may be prone to bias because parents have different understandings and interpretations of each question. Finally, a cross-sectional design does not necessarily provide insights into what happens outside the study period, as the study was limited to a specific short period of time only.

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