

Socio-demographic Determinants of Caregivers' Knowledge, Attitudes, and Practices toward Childhood Immunization in Sulaymaniyah, Iraq



Lanja Salih Ahmed, Bahar Nasradeen Majeed

Department of Paediatric Nursing, College of Nursing, University of Sulaimani, City of Sulaymaniyah, Iraq.

ABSTRACT

Childhood vaccination is one of the best pediatric interventions in the prevention of infectious diseases. Nevertheless, caregivers' knowledge, attitude, and practices (KAPs) are critical elements that determine vaccine acceptance. The purpose of this cross-sectional study was to determine the association between caregivers' socio-demographic factors and their knowledge, attitudes, and practices regarding childhood immunization in Sulaymaniyah City, Iraq. A total of 305 caregivers visiting healthcare centers in Sulaymaniyah participated in the study. Data were collected using a structured questionnaire comprising items on socio-demographic characteristics and caregivers' knowledge, attitudes, and practices regarding childhood immunization. The study results revealed that 79.7% of caregivers had good knowledge, 67.2% had positive attitudes, and 39.7% demonstrated good practices regarding childhood immunization. A high positive correlation ($P < 0.001$) was observed among caregivers' KAP. Caregiver roles, age, occupation, and educational levels had significant associations with knowledge and attitude, whereas practice had significant ($P < 0.005$) associations with occupation, educational level, and information sources. The results of the present study show that immunization practices are strongly associated with parental characteristics, including educational level, occupation, economic status, and access to healthcare services. It is imperative to improve health education campaigns and increase the involvement of health personnel.

Index Terms: Childhood Immunization, Caregivers, Knowledge, Attitudes, Practices

1. INTRODUCTION

Immunization is a fundamental public health intervention that protects individuals from infectious diseases by enhancing the body's natural immune response. One of the best methods to prevent infectious diseases and minimize

morbidity and mortality due to childhood immunization all over the world is Vaccination. This method uses the body's immune system to create resistance toward certain pathogens without developing the infection. It is an efficient and safe method which prevents children from developing serious diseases and even death [1].

Vaccination is the process of administering a vaccine to stimulate the body's immune system to develop protection against specific infectious diseases without causing the illness itself. While this is so, success of immunization programs is highly reliant on the knowledge, attitude, and practice (KAP) of the parents. The parents play the key role in decision-

Access this article online

DOI:10.21928/uhdjst.v10n2y2026.pp96-105

E-ISSN: 2521-4217

P-ISSN: 2521-4209

Copyright © 2026 Ahmed and Majeed. This is an open access article distributed under the Creative Commons Attribution Non-Commercial No Derivatives License 4.0 (CC BY-NC-ND 4.0)

Corresponding author's e-mail: Lanja Salih Ahmed, BCs Nursing, MSc student, Department of Paediatric Nursing, College of Nursing, University of Sulaimani, City of Sulaymaniyah, Iraq. E-mail: lanja.ahmed@univsul.edu.iq

Received: 21-06-2026

Accepted: 02-08-2026

Published: 30-08-2026

making when it comes to their children's health matters, and this means that their knowledge of the importance of vaccination determines whether or not their children will be vaccinated. Research studies have established that greater levels of knowledge among parents are related to favorable attitudes and practices of vaccinations [2]–[4].

The attitudes of the parents will also play a key role in the behaviors concerning vaccination. The positive attitude about the safety and efficacy of vaccines is a strong predictor of compliance with vaccination schedules, while negative attitude and misconceptions lead to vaccine hesitancy. In recent years, the proliferation of fake to miss information and distrust in health care systems has contributed to increased vaccine hesitancy around the world [5].

Furthermore, parental practice regarding childhood immunization is also affected by socio-demographic variables such as education level, occupation, and health service accessibility. Research reveals that increased parental education, especially maternal education, greatly contributes to increasing the vaccination coverage rate among children [6], good communication between health care providers and parents contributes to improving knowledge and attitude as well as vaccination practices [7].

Childhood immunization continues to be an important aspect of preventive care for children in Iraq and Kurdistan region. However, differences among parents in knowledge, attitudes, and accessibility to healthcare may influence the process of immunization. In previous research conducted in Iraq, it was found that knowledge and attitude of parents play a critical role in predicting immunization behavior, which makes KAP research very important [8], [9]. Therefore, this study aimed to determine the associations between socio-demographic factors of caregivers and the degree of their KAPs regarding childhood immunization in Sulaymaniyah City, Iraq. It is necessary to understand the factors involved to identify the shortcomings and design interventions for improving child immunization rates.

Nurses have the most frequent contact with caregivers at the point of vaccination, and their role extends beyond administering vaccines to health education, counseling on the immunization schedule, follow-up of defaulting children, and addressing parental hesitancy. Nurse-led interventions have been shown to improve immunization completion [10]. Identifying which caregivers hold weaker knowledge or less favorable attitudes is therefore directly relevant to pediatric nursing practice.

2. METHODOLOGY

2.1. Study Design

The cross-sectional analytical study that was used to determine KAP to assess caregivers toward childhood immunization.

2.2. Study Setting

The study was conducted at Dr. Jamal Ahmad Rashid Pediatric Teaching Hospital in Sulaymaniyah City, Kurdistan Region of Iraq. This hospital is the main public pediatric referral center in the region, providing comprehensive healthcare services including both, inpatient, and outpatient pediatric care in 3 months.

2.3. Study Population and Sample

The study population consisted of parents or primary caregivers of children under 5 years of age attending the hospital during the data collection period. A non-probability convenience sampling technique was used, in which caregivers who met the inclusion criteria and agreed to participate were enrolled until the required number (305) was reached. The sample size was determined using Cochran's formula.

2.4. Inclusion Criteria and Exclusion Criteria

Caregivers of children under 5 years of age who were able to communicate in the Kurdish language were included in the study. Parents who were unwilling or unable to participate were excluded from the study.

2.5. Data Collection Tool

This study used structured scoring systems for multiple domains and used the total scores and corresponding Bloom's cut-off points to provide interpretations. The study assessed parents' perceptions, knowledge, and behaviors in relation to immunizations through a structured questionnaire. The knowledge domain contained 31 items that assessed the parents' knowledge of the immunization process, immunization benefits, timelines for immunizations, and side effects of immunizations. The response options for this domain include No, do not know, and Yes. The attitude domain measured a parent's perception of and attitude about childhood vaccinations through 16 questions. The response options for this domain include Agree, Neutral, and Disagree. The practice domain measured how parents behave with regard to vaccinations using 11 questions about their actions in relation to immunization. The response options for this domain include Never, Sometimes, and Always. The level of KAP was assigned one of the following classifications based on the scoring criteria: good ($\geq 75\%$), fair ($50\% - < 75\%$), or poor ($< 50\%$).

2.6. Validity and Reliability

Content validity was established through (18) expert review in pediatric nursing and public health. A pilot study was conducted on (20) children to assess clarity and feasibility, which they were excluded from final analysis. The reliability of the instrument was evaluated using Cronbach's alpha coefficient, which yielded an overall value of 0.871, indicating high internal consistency and acceptable reliability for research instruments [11].

2.7. Data Collection Method

The data were collected through face-to-face interviews conducted in private rooms in the hospital using Kurdish language. An average time taken for each interview was about 35 min. The participants were given information on the purpose of the study and asked (orally) to consent before participating.

2.8. Ethical Considerations

Ethical clearance was provided by the Ethical Committee of Collage of Nursing of the University of Sulaymaniyah. Approval for the study was also sought from the hospital administration in the meeting (No:2/3٤) on the date (November 17, 2025). Voluntary participation, anonymity, and confidentiality were maintained through the study period.

2.9. Data Analysis

The Statistical Package for the Social Sciences 24 was used for data analysis. Inferential statistics such as Chi-square test were used to determine the relationship between socio-demographic characteristics and parents' knowledge, attitudes, and practices. A level of significance of $P \leq 0.05$ was used in the study. There are criteria of the probability level of determining the significance of the test: P -value as:

- High significant ($P < 0.001$)
- Significant ($P \leq 0.05$)
- Non-significant ($P > 0.05$)

3. RESULTS

Table 1 shows the distribution of the study sample according to the socio-demographic characteristics of the parents. The majority of the respondents were mothers (77.70%), while fathers represented 22.30%. Most of the participants were aged 30–40 years (59.67%), followed by those aged <30 years (28.85%) and those older than 40 years (11.48%), with a mean age of 32.74 ± 7.30 years. Almost all of the parents were married (99.34%). Regarding occupation, 46.89% were government-employed, 41.31% were unemployed, and 11.80% were self-employed, while the largest proportion of

TABLE 1: Parent (respondent) socio-demographic characteristics

Parent socio-demographic characteristics	Frequency	Percentage
Relationship to child		
Mother	237	77.70
Father	68	22.30
Age (years)		
<30	88	28.85
30–40	182	59.67
>40	35	11.48
Mean±SD	32.74±7.30	
Marital status		
Married	303	99.34
Separated	2	0.66
Divorced	0	0.0
Occupation		
Unemployed	126	41.31
Government-employed	143	46.89
Self-employed	36	11.80
Educational level		
Cannot read and write	9	2.95
Primary school	28	9.18
Preparatory school	73	23.93
Institute diploma	62	20.33
Bachelor's degree	113	37.05
Master's or higher	20	6.56
Residence		
Urban center	212	69.51
Suburban area	92	30.16
Rural area	1	0.33
Economic status		
Sufficient	228	74.75
Barely sufficient	69	22.62
Insufficient	8	2.62
Source of Information about childhood vaccination		
Health centers/hospitals	215	70.49
Television	12	3.93
Radio	1	0.33
Social media/internet	45	14.75
Friends	4	1.31
Family	18	5.90
Community	9	2.95
Other	1	0.33

SD: Standard deviation

the sample held a bachelor's degree (37.05%), followed by preparatory school (23.93%) and institute diploma (20.33%).

Concerning residence, the majority of the parents lived in the urban center (69.51%), followed by suburban areas (30.16%), and their economic status was mostly reported as sufficient (74.75%). Health centers and hospitals were the main source of information about childhood vaccination (70.49%), followed by social media and the internet (14.75%) and family (5.90%), while the remaining sources were reported by less than 4% each.

Table 2 shows that most of the parents had a good level of knowledge (79.7%) and a good level of attitude (67.2%)

TABLE 2: Distribution of sample according to overall parent levels of knowledge, attitude, and practice toward childhood immunization

Severity	Knowledge	Attitudes	Practices
	Fr (%)	Fr (%)	Fr (%)
Poor	8 (2.6)	26 (8.5)	18 (5.9)
Fair	54 (17.7)	74 (24.3)	166 (54.4)
Good	243 (79.7)	205 (67.2)	121 (39.7)
Total	305 (100)	305 (100)	305 (100)

toward childhood immunization. Regarding practices, more than half had a fair level (54.4%), while only 39.7% had a good level of practice, indicating that the parents' practices were lower than their knowledge and attitudes.

Table 3 shows significant associations between the parents' level of knowledge and their relationship to the child ($P = 0.006$), age ($P = 0.012$), occupation ($P = 0.009$), and educational level ($P = 0.008$). Mothers, parents aged 30–40 years, government employees, and those with a bachelor's degree showed the highest proportions of good knowledge. No significant associations were found with

TABLE 3: Association between sample characteristics and their level of knowledge about childhood immunization

Parent socio-demographic	Level of the knowledge			P-value
	Poor	Fair	Good	
	Fr (%)	Fr (%)	Fr (%)	
Relationship to child				
Mother	3 (37.50)	38 (70.37)	196 (80.66)	0.006
Father	5 (62.50)	16 (29.63)	47 (19.34)	
Age (years)				
<30	4 (50.00)	25 (46.30)	59 (24.28)	0.012
30–40	3 (37.50)	23 (42.59)	156 (64.20)	
>40	1 (12.50)	6 (11.11)	28 (11.52)	
Marital status				
Married	8 (100.00)	53 (98.15)	242 (99.59)	0.482
Separated	0 (0.00)	1 (1.85)	1 (0.41)	
Occupation				
Unemployed	2 (25.00)	21 (38.89)	103 (42.39)	0.009
Government-employed	3 (37.5)	23 (42.59)	117 (48.15)	
Self-employed	3 (37.50)	10 (18.52)	23 (9.47)	
Educational level				
Cannot read and write	0 (0.00)	6 (11.11)	3 (1.23)	0.008
Primary school	0 (0.00)	5 (9.26)	23 (9.47)	
Preparatory school	5 (62.50)	12 (22.22)	56 (23.05)	
Institute diploma	1 (12.50)	10 (18.52)	51 (20.99)	
Bachelor's degree	1 (12.50)	19 (35.19)	93 (38.27)	
Master's or higher	1 (12.50)	2 (3.70)	17 (7.00)	
Residence				
Urban center	5 (62.50)	37 (68.52)	170 (69.96)	0.301
Suburban area	3 (37.50)	16 (29.63)	73 (30.04)	
Rural area	0 (0.00)	1 (1.85)	0 (0.00)	
Economic Status				
Sufficient	5 (62.50)	34 (62.96)	189 (77.78)	0.175
Barely sufficient	3 (37.50)	18 (33.33)	48 (19.75)	
Insufficient	0 (0.00)	2 (3.70)	6 (2.47)	
Source of information about childhood vaccination				
Health centers/hospitals	3 (37.50)	34 (62.96)	178 (73.25)	0.157
Television	0 (0.00)	3 (5.56)	9 (3.70)	
Radio	0 (0.00)	1 (1.85)	0 (0.00)	
Social media/internet	4 (50.00)	9 (16.67)	32 (13.17)	
Friends	0 (0.00)	2 (3.70)	2 (0.82)	
Family	1 (12.50)	4 (7.41)	13 (5.35)	
Community	0 (0.00)	1 (1.85)	8 (3.29)	
Other	0 (0.00)	0 (0.00)	1 (0.41)	
Total	8 (100)	54 (100)	243 (100)	

marital status, residence, economic status, or source of information ($P > 0.05$).

Table 4 shows significant associations between the parents' level of attitude and their relationship to the child ($P = 0.016$), age ($P = 0.03$), occupation ($P = 0.031$), educational level ($P = 0.041$), and residence ($P = 0.004$). Mothers, parents aged 30–40 years, unemployed parents, and those with a bachelor's degree showed the highest proportions of good attitude, while parents living in the urban center represented the majority of this group (66.34%). No significant associations

were found with marital status, economic status, or source of information ($P > 0.05$).

Table 5 shows significant associations between the parents' level of practice and their occupation ($P = 0.001$), educational level ($P = 0.04$), and source of information about childhood vaccination ($P = 0.026$). Government-employed parents (54.54%), those with a bachelor's degree (47.11%), and those obtaining information from health centers and hospitals (73.55%) showed the highest proportions of good practice. No significant associations were found with relationship to

TABLE 4: Association between sample characteristics and their attitude about childhood immunization

Parent socio-demographic	Level of the attitude			P-value
	Poor	Fair	Good	
	Fr (%)	Fr (%)	Fr (%)	
Relationship to child				
Mother	17 (65.38)	51 (68.92)	169 (82.44)	0.016
Father	9 (34.62)	23 (31.08)	36 (17.56)	
Age (years)				
<30	11 (42.31)	25 (33.78)	52 (25.37)	0.03
30–40	15 (57.69)	36 (48.65)	131 (63.90)	
>40	0 (0.00)	13 (17.57)	22 (10.73)	
Marital status				
Married	25 (96.15)	74 (100.00)	204 (99.51)	0.098
Separated	1 (3.85)	0 (0.00)	1 (0.49)	
Occupation				
Unemployed	6 (23.08)	22 (29.73)	98 (47.80)	0.031
Government-employed	14 (53.84)	40 (54.06)	89 (43.41)	
Self-employed	6 (23.08)	12 (16.22)	18 (8.78)	
Educational level				
Cannot read and write	1 (3.85)	5 (6.76)	3 (1.46)	0.041
Primary school	0 (0.00)	5 (6.76)	23 (11.22)	
Preparatory school	5 (19.23)	12 (16.22)	56 (27.32)	
Institute diploma	6 (23.08)	13 (17.57)	43 (20.98)	
Bachelor's degree	14 (53.85)	33 (44.59)	66 (32.20)	
Master's or higher	0 (0.00)	6 (8.11)	14 (6.83)	
Residence				
Urban center	17 (65.38)	59 (79.73)	136 (66.34)	0.004
Suburban area	8 (30.77)	15 (20.27)	69 (33.66)	
Rural area	1 (3.85)	0 (0.00)	0 (0.00)	
Economic status				
Sufficient	19 (73.08)	54 (72.97)	155 (75.61)	0.870
Barely sufficient	7 (26.92)	18 (24.32)	44 (21.46)	
Insufficient	0 (0.00)	2 (2.70)	6 (2.93)	
Source of information about childhood vaccination				
Health centers/hospitals	13 (50.00)	51 (68.92)	151 (73.66)	0.194
Television	1 (3.85)	5 (6.76)	6 (2.93)	
Radio	0 (0.00)	1 (1.35)	0 (0.00)	
Social media/internet	8 (30.77)	8 (10.81)	29 (14.15)	
Friends	1 (3.85)	1 (1.35)	2 (0.98)	
Family	3 (11.54)	4 (5.41)	11 (5.37)	
Community	0 (0.00)	4 (5.41)	5 (2.44)	
Other	0 (0.00)	0 (0.00)	1 (0.49)	
Total	26 (100)	74 (100)	205 (100)	

TABLE 5: Association between sample characteristics and their practice toward childhood immunization

Parent socio-demographic	Level of the practice			P-value
	Poor	Fair	Good	
	Fr (%)	Fr (%)	Fr (%)	
Relationship to child				
Mother	15 (83.33)	130 (78.31)	92 (76.03)	0.756
Father	3 (16.67)	36 (21.69)	29 (23.97)	
Age (years)				
<30	8 (44.44)	54 (32.53)	26 (21.49)	0.072
30–40	10 (55.56)	91 (54.82)	81 (66.94)	
>40	0 (0.00)	21 (12.65)	14 (11.57)	
Marital status				
Married	18 (100.00)	164 (98.80)	121 (100.00)	0.43
Separated	0 (0.00)	2 (1.20)	0 (0.00)	
Occupation				
Unemployed	11 (61.11)	74 (44.58)	41 (33.88)	0.001
Government-employed	4 (22.23)	73 (43.97)	66 (54.54)	
Self-employed	3 (16.67)	19 (11.45)	14 (11.57)	
Educational level				
Cannot read and write	0 (0.00)	9 (5.42)	0 (0.00)	0.040
Primary school	2 (11.11)	17 (10.24)	9 (7.44)	
Preparatory school	7 (38.89)	44 (26.51)	22 (18.18)	
Institute diploma	3 (16.67)	35 (21.08)	24 (19.83)	
Bachelor's degree	6 (33.33)	50 (30.12)	57 (47.11)	
Master's or higher	0 (0.00)	11 (6.63)	9 (7.44)	
Residence				
Urban center	14 (77.78)	108 (65.06)	90 (74.38)	0.398
Suburban area	4 (22.22)	57 (34.34)	31 (25.62)	
Rural area	0 (0.00)	1 (0.60)	0 (0.00)	
Economic Status				
Sufficient	15 (83.33)	118 (71.08)	95 (78.51)	0.549
Barely sufficient	3 (16.67)	43 (25.90)	23 (19.01)	
Insufficient	0 (0.00)	5 (3.01)	3 (2.48)	
Source of information about childhood vaccination				
Health centers/hospitals	8 (44.44)	118 (71.08)	89 (73.55)	0.026
Television	0 (0.00)	8 (4.82)	4 (3.31)	
Radio	0 (0.00)	1 (0.60)	0 (0.00)	
Social media/internet	8 (44.44)	27 (16.27)	10 (8.26)	
Friends	0 (0.00)	1 (0.60)	3 (2.48)	
Family	2 (11.11)	6 (3.61)	10 (8.26)	
Community	0 (0.00)	4 (2.41)	5 (4.13)	
Other	0 (0.00)	1 (0.60)	0 (0.00)	
Total	18 (100)	166 (100)	121 (100)	

the child, age, marital status, residence, or economic status ($P > 0.05$).

4. DISCUSSION

Table 1 reveals that mothers formed the majority of the respondents (77.7%) compared to fathers (22.3%). This is because mothers play a key part in caregiving activities and constitute the main interface in child healthcare provision and immunizations, as indicated by previous studies in which mothers were actively involved in vaccine decision-making, especially due to frequent interaction with the health

sector [12], [13]. The majority of parents (59.67%) in this study were aged between 30 and 40 years with a mean age of 32.74 ± 7.30 years, implying that they were within their prime period of reproduction, which implies frequent experience with maternal and child health services, thereby promoting immunization, as shown by previous studies in which young parents were more active in vaccine decisions and child health programs [2], [14]. Almost all of them lived together (99.34%), implying that the families had a stable background, enabling married families to improve their techniques concerning the care, and decision-making regarding the health of their children [4]. In relation to occupation, less

than half of the parents (46.89%) were formally employed, while those who were unemployed constituted 41.31% of the parents and those self-employed represented the least percentage (11.80%) [4].

With regard to education, over one-third of the respondents had attained a bachelor's degree (37.05%), followed by preparatory (23.93%) and diploma (20.33%), being a relatively educated sample population, and because education is known as an important factor influencing health literacy, educated people would be knowledgeable concerning immunization schedules and safety, just as found in Sarker *et al.* [4]. The majority of people belonged to urban communities (69.51%) with very few being from rural communities because urban communities have easy access to healthcare facilities, vaccination drives, and health education, and this might be responsible for increasing awareness about immunization in such communities since there are studies supporting the fact that urban communities have higher vaccination rates compared to rural communities due to easy access [15]. The majority of the subjects reported having adequate income (74.75%), while a smaller proportion had inadequate income, and this can play an important role in facilitating healthcare facility access and reducing indirect costs of vaccination since there are studies supporting the fact that higher socioeconomic status is correlated with better healthcare facility utilization, including childhood vaccination [4], [16]. Finally, health centers and hospitals were the main sources of vaccination information (70.49%) when compared with social media, family, or other traditional media since healthcare providers have an important role in providing information to parents, as supported by other studies [2], [7].

Table 2 depicts the parents' KAPs in relation to childhood immunization. Nearly three-quarters of parents (79.7%) were found to have good knowledge, while the percentage having poor knowledge is the least among the sample (2.6%). It suggests that through education on the benefits of immunization, schedule of immunization, and its importance in prevention from infectious diseases, adequate awareness has been created amongst the majority of the parents. The higher rate of knowledge might be due to the success of routine immunization and health education programs in the area of study, which has been reported in Brown *et al.* [10] as well. In case of attitude, 67.2% of parents had positive attitude toward childhood immunization, while 8.5% had negative attitude, which reflects fairly positive perception. Positive attitude is very important as it directly affects the compliance of parents in getting their children vaccinated and following their schedule for vaccinations, which is also

reported by Sarker *et al.* [4], Nassar *et al.* [17], and Tilahun *et al.* [18].

In contrast, the practice was fairly poor with only 39.7% of the parents having good practice and the majority (54.4%) having fair practice. The difference is due to the fact that good knowledge and positive attitude may not necessarily lead to proper vaccination practices, where a number of factors such as inaccessibility of services, lack of time, forgetfulness, or absence of follow-up system could be blamed for this issue. Some studies have found that there existed a gap between the knowledge and the practice of immunization among the parents [10], [19], [20].

In Table 3, it is seen that many socio-demographic variables have a significant impact on the knowledge of parents regarding childhood vaccinations. There was higher knowledge among mothers than fathers, which was due to the fact that mothers play an important role in taking care of children in healthcare, vaccination services, and communication with health providers [4], [21]. The group having the highest knowledge was that of age group 30–40 years, which is due to their maturity, experience, and healthcare visits [4]. The knowledge was also influenced by the status of employment, as those parents who were formally employed had higher knowledge (48.15%) than those who were not (42.39%) or self-employed (9.47%). This was due to the increased availability of healthcare information through employment [4], [22]. Educational level was highly significant since high education enhances health literacy, which enables parents to grasp the information on vaccines and make an educated decision [21]–[24].

In contrary, some of the factors had no significant relationship with the knowledge levels. Marital status was not one of the significant determinants compared to the other determinants [4], [22]. Residence was not significantly related to the knowledge despite the fact that urban respondents scored higher because there was inadequate data from rural areas, although previous researchers indicate a connection between urban residence and knowledge due to access to services [4], [21]. Economic status also had no significant relationship even though the respondents with enough income scored high due to adequate access to health and education resources [4], [25]. Finally, the source of information was not significantly associated with knowledge, although health centers were the main source among well-informed parents, suggesting that the quality, clarity, and frequency of communication matter more than access alone [4], [24].

In Table 4, several sample characteristics were significantly associated with parental attitudes toward childhood immunization, including relationship to the child, age, occupation, educational level, and residence, whereas marital status, economic status, and source of information showed no statistically significant associations [4], [22]. Mothers scored significantly higher than fathers on positive attitudes, likely because they were more represented in the sample and are typically more involved in preventive healthcare [4]. Attitudes were also strongly associated with age, with parents aged 30–40 years showing the highest proportion of positive attitudes, possibly reflecting greater maturity, parenting experience, and exposure to health education during active child-rearing years [7], [12]. Occupation was significantly related to attitudes ($P = 0.031$), with unemployed and government-employed parents better represented in the good-attitude group and self-employed parents the least; this may reflect differences in health awareness, healthcare exposure, time for childcare, and socioeconomic factors, consistent with previous findings that parents working in the health industry hold favorable attitudes [4], [26].

Education was also significantly related to attitudes; although positive attitudes appeared at every level, differences in their distribution suggest education shapes how vaccine information is perceived, even as personal experience and trust in the healthcare system also play a role [7], [12], [13], [26]. Residence was highly significantly associated with attitudes, as urban residents were more positive than suburban and rural ones, likely due to better access to health facilities, immunization programs, and health education campaigns [22], [27]. Unlike marriage status, which was insignificant due to lack of variation since the majority lived together [4], economic status was also insignificant, showing that income has a minimal effect when vaccines are easily accessible and provided for free [4], [22]. Finally, source of information was found to have an insignificant association with attitudes; despite the health centers being the primary source of information, the mass media and social networking had an insignificant effect on attitudes towards vaccination, meaning that the credibility and consistency of information is crucial in health communication [4], [28].

As presented in Table 5, there was no significant correlation between the parent's relationship with the child and parental practice with regard to childhood immunization; most of the study participants were mothers for all relationships with the children without any significant difference in practice between mothers and fathers. This implies that after building up the knowledge and attitude toward childhood immunization,

the two can play an equal role in vaccine practices. Practice is also influenced by family situation and health care service environment, as well as [22] have observed before. Age of the parents had no significant correlation while better practice was seen in parents above 30 years old, perhaps as a result of the effects of parenting experience, maturity, and exposure to healthcare services on vaccine practice [7]. Marital status did not have any significant relationship with practice either, which might be a result of the similarity of the participants in the study as almost all of them were living together, and which is in agreement with previous studies where marital status does not affect vaccine practice in the presence of healthcare services [1]. However, occupation had a significant effect on vaccine practice where unemployed people were more represented in poor practice while government workers were in good practice; This may be because employment influences vaccination practices through economic stability, institutional education, and healthcare services, which have been demonstrated in some studies [29], [30].

Educational level was also strongly associated with the practice, as parents with higher levels of education were more obedient regarding vaccination, as education increases health literacy and helps the parent comprehend the vaccination schedule, just like mentioned in Alshammari *et al.* [9] and Al-Lela *et al.* [16]. Residence, however, showed no significant relationship with practice; although urban parents practiced more than rural ones, the difference was insignificant, possibly reflecting equal vaccination opportunities across geographical regions, as similarly suggested by Tilahun *et al.* [18] and Zemariam *et al.* [31]. The economic status was not significant either, suggesting that the vaccine could be equally available to people at all economic levels if made free of cost [16]. Moreover, there was a significant relationship observed between information source and practice ($P = 0.026$). The practices were better among those parents who received the information from health centers and hospitals, which signify the important role played by healthcare professionals in promoting vaccine adherence through proper communication and counseling, consist with [18].

5. LIMITATIONS

Several limitations should be considered when interpreting these findings. The cross-sectional design permits the identification of associations but not causal or temporal inference. Participants were recruited by non-probability convenience sampling from a single tertiary pediatric referral hospital, so the sample does not represent the general caregiver

population of Sulaymaniyah, and rural caregivers were almost absent (0.33%), which restricted the residence comparison to urban and suburban participants. Practice was measured by caregiver self-report and was not verified against immunization cards or health center records, introducing possible recall and social desirability bias. In addition, some response categories contained small numbers of participants, which reduced the statistical power of the chi-square comparisons, and data were collected in the Kurdish language only, excluding caregivers who communicate in other languages.

6. RECOMMENDATIONS

Based on these findings, regular structured health education sessions should be conducted for caregivers, focusing on the immunization schedule, the timing of doses, and the management of expected side effects. Because the study identified a gap between knowledge and practice rather than a lack of information, nurses should provide evidence-based counseling at every child visit, supported by reminder methods such as mobile phone alerts and follow-up calls to improve adherence to the vaccination timetable. Caregivers with lower educational attainment and those not in formal employment showed the lowest proportions of good practice and should be prioritized for individualized counseling, while fathers, who demonstrated lower knowledge and less favorable attitudes than mothers, should be actively involved in immunization education. Since caregivers informed by health centers and hospitals showed the highest proportion of good practice, health facilities should be strengthened as the primary source of immunization information and integrated into maternal and child health programs. Future studies should be conducted on larger probability-based samples across multiple cities and primary healthcare centers, verifying reported practice against immunization records, and interventional and qualitative research is recommended to explore and address the knowledge–practice gap identified in this study.

7. CONCLUSION

The results of the present study found that caregivers in Sulaymaniyah City hold a good level of knowledge (79.7%) and a positive attitude (67.2%) toward childhood immunization, yet only 39.7% achieved a good level of practice, identifying the knowledge–practice gap, rather than a deficit of information, as the central problem. KAP were positively and significantly correlated ($P < 0.001$), indicating that knowledge is translated into behavior through attitude.

Caregiver role, age, occupation, and educational level were significantly associated with both knowledge and attitude, whereas practice was associated with occupation, educational level, and source of information, with caregivers informed by health centers and hospitals showing the highest proportion of good practice (73.55%). Caregivers in this setting therefore accept immunization in principle but require sustained professional support to act on it consistently.

8. ACKNOWLEDGMENTS

The authors would like to express their sincere appreciation to all participants who contributed to this study. We are grateful to the staff and healthcare professionals who assisted with data collection and supported the research process. Special thanks are extended to our supervisors and academic faculty for their guidance and valuable support throughout this work. Their contributions and cooperation were essential for the successful completion of this study.

REFERENCES

- [1] S. Al-Dahir, T. A. L. Hassan, W. Moss, A. Khalil, G. Burnham, M. D. Knoll, S. M. M. Hossain and K. Talaat. "The impact of coronavirus pandemic shutdowns on immunization completion in Hadeetha, Anbar, Iraq: A case-study of vaccine completion in a recovering healthcare system". *Vaccine*, vol. 42, suppl. 5, p. 126383, 2024.
- [2] W. Al-Qerem, A. Jarab, A. Hammad, F. Alasmari, J. Ling, A. H. Alsajri, S. W. Al-Hishma and S. R. Abu Heshmeh. "Iraqi parents' knowledge, attitudes, and practices towards vaccinating their children: A cross-sectional study". *Vaccines (Basel)*, vol. 10, no. 5, p. 820, 2022.
- [3] J. Joseph, S. Vijayalakshmi Devarashetty, N. Shetty and M. Sushma. "Parents' knowledge, attitude, and practice on childhood immunization". *International Journal of Basic and Clinical Pharmacology*, vol. 4, no. 6, pp. 1201-1207, 2015.
- [4] A. R. Sarker, R. Akram, N. Ali and M. Sultana. "Coverage and factors associated with full immunisation among children aged 12-59 months in Bangladesh: Insights from the nationwide cross-sectional demographic and health survey". *BMJ Open*, vol. 9, no. 7, p. e028020, 2019.
- [5] A. De Figueiredo, C. Simas, E. Karafillakis, P. Paterson and H. J. Larson. "Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: A large-scale retrospective temporal modelling study". *The Lancet*, vol. 396, no. 10255, pp. 898-908, 2020.
- [6] A. Gebreyesus and K. Tesfay. "Effect of maternal education on completing childhood vaccination in Ethiopia: Systematic review and meta-analysis". *Scientific Reports*, vol. 14, no. 1, p. 17453, 2024.
- [7] P. Matta, R. El Mouallem, M. Akel, S. Hallit and M. C. Fadous Khalife. "Parents' knowledge, attitude and practice towards children's vaccination in Lebanon: Role of the parent-physician communication". *BMC Public Health*, vol. 20, no. 1, p. 1439, 2020.

- [8] R. S. Hassan and A. H. Bayati. "Evaluation of the effectiveness of hepatitis B vaccination in children aged 1 to 14 years in Sulaimani City". *Advanced Medical Journal*, vol. 4, no. 2, pp. 69-73, 2018.
- [9] S. Z. Alshammari, I. Alfayyad, Y. Altannir and M. Al-Tannir. "Parental awareness and attitude about childhood immunization in Riyadh, Saudi Arabia: A cross-sectional study". *International Journal of Environmental Research and Public Health*, vol. 18, no. 16, p. 8455, 2021.
- [10] V. B. Brown, O. A. Oluwatosin, J. O. Akinyemi and A. A. Adeyemo. "Effects of community health nurse-led intervention on childhood routine immunization completion in primary health care centers in Ibadan, Nigeria". *Journal of Community Health*, vol. 41, no. 2, pp. 265-273, 2016.
- [11] K. S. Taber. "The use of Cronbach's alpha when developing and reporting research instruments in science education". *Research in Science Education*, vol. 48, no. 6, pp. 1273-1296, 2018.
- [12] A. N. Mohamud, A. Feleke, W. Worku, M. Kifle and H. R. Sharma. "Immunization coverage of 12-23 months old children and associated factors in Jigjiga District, Somali National Regional State, Ethiopia". *BMC Public Health*, vol. 14, p. 865, 2014.
- [13] W. Simegn, M. Diress, Y. Y. Gela, D. G. Belay, A. A. Kibret and D. Chilot. "Childhood vaccination practices and associated factors among mothers/caregivers in Debre Tabor town, Northwest Ethiopia: A cross-sectional study". *Frontiers in Pediatrics*, vol. 11, p. 1070722, 2023.
- [14] A. Debie and A. M. Lakew. "Factors associated with the access and continuum of vaccination services among children aged 12-23 months in the emerging regions of Ethiopia: Evidence from the 2016 Ethiopian demography and health survey". *Italian Journal of Pediatrics*, vol. 46, no. 1, p. 28, 2020.
- [15] K. M. Berri, Y. K. Adaba, T. G. Tarefasa, N. D. Bededa and D. B. Fekene. "Maternal health service utilization from urban health extension professionals and associated factors among women who gave birth in the last one year in Ambo town, Oromia Regional State, Ethiopia, 2018". *BMC Public Health*, vol. 20, no. 1, p. 499, 2020.
- [16] O. Q. B. Al-Lela, M. B. Bahari, H. K. Al-Qazaz, M. R. M. Salih, S. Q. Jamshed and R. M. Elkalimi. "Factors underlying inadequate parents' awareness regarding pediatrics immunization in Iraq". *BMC Pediatrics*, vol. 14, p. 29, 2014.
- [17] S. Nassar, S. Alshahwan, R. Alshahwan, S. Halasa, S. Alashhab and M. Alnajjar. "Determinants of parents' knowledge, attitudes, and practice toward childhood vaccination: A national study". *The Open Nursing Journal*, vol. 17, no. 1, pp. 1-10, 2023.
- [18] B. Tilahun, Z. Mekonnen, A. Sharkey, A. Shahabuddin, M. Feletto, M. Zelalem and K. Sheikh. "What we know and don't know about the immunization program of Ethiopia: A scoping review of the literature". *BMC Public Health*, vol. 20, p. 1365, 2020.
- [19] N. Rezaei-Tavabe, S. Kheiri, M. S. Mousavi and A. Mohammadian-Hafshejani. "The effect of monovalent influenza vaccine on the risk of hospitalization and all-cause mortality according to the results of randomized clinical trials: A systematic review and meta-analysis". *Iranian Journal of Public Health*, vol. 52, no. 5, pp. 924-936, 2023.
- [20] O. A. Ogundele and T. Ogundele. "Determinants of incomplete vaccination among children 12-23 months in Nigeria: An analysis of a national sample". *Tzu Chi Medical Journal*, vol. 34, no. 4, pp. 448-455, 2022.
- [21] W. Animaw, W. Taye, B. Merdekios, M. Tilahun and G. Ayele. "Expanded program of immunization coverage and associated factors among children age 12-23 months in Arba Minch town and Zuria District, Southern Ethiopia, 2013". *BMC Public Health*, vol. 14, p. 464, 2014.
- [22] R. K. Sinuraya, A. S. W. Kusuma, Z. E. Pardoel, M. J. Postma and A. A. Suwantika. "Parents' knowledge, attitude, and practice on childhood vaccination during the COVID-19 pandemic in Indonesia". *Patient Preference and Adherence*, vol. 16, pp. 105-112, 2022.
- [23] O. A. Adefolalu, O. J. Kanma-Okafor and M. R. Balogun. "Maternal knowledge, attitude and compliance regarding immunization of under five children in primary health care centres in Ikorodu Local Government Area, Lagos State". *Journal of Clinical Sciences*, vol. 16, no. 1, pp. 7-14, 2019.
- [24] T. M. Alshammari, G. M. Subaiea, T. Hussain, A. Moin and K. B. Yusuf. "Parental perceptions, attitudes and acceptance of childhood immunization in Saudi Arabia: A cross sectional study". *Vaccine*, vol. 36, no. 1, pp. 23-28, 2018.
- [25] S. Pandey, A. K. Singh, P. Pandey, A. Ranjan, C. Singh and S. K. Pragma. "Socio-demographic determinants of childhood immunization coverage in rural population of Bhojpur district of Bihar, India". *Journal of Family Medicine and Primary Care*, vol. 8, no. 7, pp. 2484-2490, 2019.
- [26] F. E. Younis, O. S. Elseifi, F. M. Toonisi, M. A. Alsamti, H. T. Alanazi and E. M. Mortada. "Parental perspectives on childhood vaccination: Analysing knowledge and attitudes among families in Tabuk, Saudi Arabia". *Patient Preference and Adherence*, vol. 19, pp. 2711-2721, 2025.
- [27] M. Alwhaibi, N. Al Aloola, M. AlSawnadi and N. Alhumud. "Parental vaccine hesitancy, awareness, and attitudes toward childhood vaccination in Saudi Arabia". *Patient Prefer and Adherence*, vol. 19, pp. 3363-3372, 2025.
- [28] A. H. Mohammed, B. A. R. Hassan, A. M. Wayyes, A. Q. Gadhban, A. Blebil, S. A. Alhija, R. M. Darwish, A. T. Al-Zaabi, G. Othman, A. A. S. Jaber, B. A. Al Shouli, J. Dujaili, O. A. Al-Ani and F. M. S. Muthanna. "Parental health beliefs, intention, and strategies about COVID-19 vaccine for their children: A cross-sectional analysis from five Arab countries in the Middle East". *Vaccine*, vol. 40, no. 45, pp. 6549-6557, 2022.
- [29] S. Saleh and P. Chedid. "Knowledge, attitude and practice toward childhood immunization among mothers in Lebanon". *PLoS One*, vol. 20, no. 5, p. e0322205, 2025.
- [30] S. Shahid, H. Shakir, M. Ayesha, A. Kainat, Qurat-ul-Ain, A. Ijaz, M. A. Tahir, M. Fahad, M. Mughal, M. Fatima, U. Amjad and M. Z. Iqbal. "Factors influencing parental practices regarding childhood immunization in Lahore, Pakistan". *Journal of Pharmaceutical Research International*, vol. 36, no. 11, pp. 241-252, 2024.
- [31] A. B. Zemariam, G. K. Abebe, M. A. Kassa, A. W. Alamaw, R. W. Molla, B. B. Abate, B. D. Tilahun, W. T. Wondie, R. A. Shimelash and M. Fentanew. "Immunization coverage and its associated factors among children aged 12-23 months in Ethiopia: An umbrella review of systematic review and meta-analysis studies". *PLoS One*, vol. 19, no. 3, p. e0299384, 2024.