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Vaccination Coverage Among Under Five Years Old Children in Erbil Governorate: A Comprehensive Survey

Farqad Ahmed Jawad[1]*, Namir Ghanim Al-Tawil[2]

[1] Department of community medicine, College of Medicine, Hawler Medical University, Erbil Kurdistan- Iraq.
[2] Department of community medicine, College of Medicine, Hawler Medical University, Erbil Kurdistan- Iraq.
EM: farqad.ahmad88@gmail.com

*Corresponding author. Farqad Ahmed Jawad (farqad.ahmad88@gmail.com)

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Abstract

Background: Childhood immunization, or the application of vaccines to initiate immunity, is thought to be crucial for increasing a child's chance of survival. The most economical global health approach to lower child death and disability related to contagious diseases is immunization, which is a fundamental health care preventive practice. Objectives: To find out the proportion of defaulters from the immunization program in the urban areas, and to compare it with the proportion in the rural areas and to determine the relationship between other variables and immunization status (Parents occupation and educational levels, child order in his family, marital status of the mother, presence of PHC centers in the area, etc.). Methods: A cross-sectional study (household survey) was carried out on 1800 under five years old children living in the urban and rural areas of Erbil governorate, Kurdistan, Iraq. The questionnaire was developed by the researcher. The data were analyzed by SPSS, version 26, software. A p-value of ≤ 0.05 was considered, statistically significant. Results: The defaulter rate was 36.2% in Erbil governorate (60.3 % in rural areas, 24.2% in urban areas). The high defaulter rate was associated with low rank occupations like unskilled and semi-skilled mothers (the rates were 72.7% and 40% respectively), and with low educational levels (52.5% among illiterate mothers, and 43.2% among women who can just read and write or graduates of primary schools) ($p < 0.001$). Conclusions: The rate of defaulters was high, particularly in rural areas. Factors including mothers' poor educational levels and low-status employment that are linked to children skipping vaccinations have a significant impact on the default rate.

Keywords
Vaccination, Defaulter, Erbil governorate, under five children

Vaccines prevent more than two million deaths worldwide each year [1], [2]. In addition to preventing diseases and disabilities for millions of people and even more. Since the development of the polio vaccine, for instance, it has been estimated that five million people who would have been paralyzed by the poliovirus are walking today. To control and eradicate many cases of diseases that can be prevented by vaccination, a high level of immunization coverage must be maintained. Unfortunately, more than 10 million children in underdeveloped nations pass away each year as a result of inadequate evaluation of beneficial measures like immunization, which would battle prevalent and preventable childhood diseases [3]. To receive the most benefits from immunization, it is crucial to ensure that vaccination rates are as high as possible. Despite the

accessibility of vaccines, three million children are thought to die globally each year from diseases that can be prevented by vaccination. One of the most crucial tactics used by programs for the survival of children around the world is vaccination coverage [4]. Numerous studies highlighted the causes of vaccination discontinuation included insufficient hospitals' availability of vaccines, lack of mother knowledge about: the advantages of vaccination, routine vaccination according to plan, the number of doses that are considered necessary, and also have the belief that too many vaccines can be hurtful. Other factors included unawareness of the need for immunization and returning for the next dose, as well as loss of faith in immunization among mothers [5], [6]. All children in Iraq should receive the following vaccines by the time they turn one: BCG vaccination for tuberculosis, three doses of DPT for diphtheria, pertussis, and tetanus, four doses of polio vaccine, three doses of Hepatitis B (Hep B), and a measles shot at nine months of age. All vaccinations are included in expanded program of immunization (EPI) in Erbil [7]. Along with polio outbreak, the wild measles virus was brought into Iraq by Syrian refugees in 2014 [8]. The Anbar conflict on January 9, 2014, and the Mosul crisis on June 9, 2014, not only destroyed the physical infrastructure of healthcare facilities (hospitals, public health clinics, etc.), but they also dislocated healthcare professionals (doctors, nurses, displaced health workers, nurses, paramedics, etc.) and caused a variety of other issues [8]. The Kurdistan Region Government already overburdened health system in the three governorates has been further exacerbated by the influx of nearly 1,500,000 internally displaced people (IDPs) in Erbil, Duhuk and Sulymania. The area was already struggling financially and was already hosting over 200,000 Syrian migrants as a result of political disagreements with the central government. Anbar, Ninewa, Diyala, Salah Al-Din, and Kirkuk already had some of the nation's lowest health and nutrition statistics prior to the crisis [9]. The likelihood of the wild polio virus spreading to Anbar, Ninewa, Diyala, Salah Al-Din, and Kirkuk is fairly high given the outbreak in Syria's bordering Deir Ez-Zor province (which borders Anbar). Because the MOH, WHO, and UNICEF immunization initiatives have been seriously affected, coverage levels have fallen [10].

Objectives

To find out the proportion of defaulters from the immunization program in the urban areas, and to compare it with the proportion in the rural areas and to determine the relationship between immunization history and other factors (Parents occupation and educational levels, child order in his family, marital status of the mother, presence of PHC centers in the area, etc.).

Methods

A cross-sectional descriptive study was conducted in Erbil governorate (rural and urban areas), it started on May 15, 2021 and ended on September 1, 2023. The data collection was carried out by interviewing the mothers using a questionnaire, during the period of August 18, 2021 to December 27, 2021.

Multi stage cluster sampling method was carried out. There are six municipalities in Erbil city, three of them were selected using simple random sampling by Excel, accordingly, municipalities number 3, 4, and 5 had been selected, and then five quarters were selected randomly from each municipality, so the total selected quarters were 15, and those were: Khanzad, Sarwaran havalan, Manara, Mamostayan, Khabat, Mufty ronaky street, Gullan, Hawler new, Briaty, Safeen3, Andazyaran, Zankoo, Azady, Rasty, and Ronaky. Rural areas who had been visited by the researcher during the household survey were as follows: Kore, Babishtian Soran, Garota, Spekrah, Pongeena, Hujaran, Seberan, Kani qurzalla, Dosara jabar, Dosara fatih, Yaramja, Kardarash Zab, Qalamortic, Si garka, Jajnikan Abu bakir .

The sample size was estimated by the Epi info 7 computer programs. The following information had been entered into the program: population of under 5 years old children was 750, 000 children, the estimated defaulter rate was set as 10% [11],

absolute precision was set at 2%, design effect was set at 2, and a 95% confidence interval was chosen. Accordingly, the estimated sample size was 1726. For convenience 1800 children were included in the study, 1200 from urban areas (Erbil city) and 600 from the rural areas. Eighty children were selected randomly from each quarter (80 children X 15 quarters = 1200 children). The quarter included streets, and the first street was selected randomly, and then the other streets were selected by systematic random sampling. Around eight streets were taken from each quarter (around 10 children from each street, so the total is 80 children). Regarding the rural areas, 15 areas were selected conveniently, and the number of children taken from each area depended on the availability of children in that area and the population density.

The study was agreed by the research ethics team of the college of medicine. Oral agreement was taken from the mothers before starting the interview. Inclusion criteria: Mothers who have one child (or more) of less than five years of age. Sometimes the fathers made translation to Arabic in case of presence of language barrier. Exclusion criteria: Families who refused to participate and answer the questions of the questionnaire. Response rate: About 15 families from urban areas (Saroran havalan, Manara, Mufty ronaky street, Braity, Zankoo, Azady, and Rasty) refused to open the door during the household survey period and they didn't have the ability to participate in the study due to security condition therefore the researcher doesn't know the number of children that they have accurately.

A questionnaire was developed after extensive review of relevant literature. A group of experts (20 experts) have assessed the content validity of the study. Accordingly, minor changes had been done. The questionnaire was made in English, and then translated to Arabic, knowing that the mother tongue of the researcher was Arabic. The interviews had been done, either in Arabic, English, or Kurdish (with the help of a translator).

The following information were collected: demographic data of the involved children in the study; residency (urban and rural), address, age of the mother and the father in years, age of the child in months, marital status of the mother (married, divorced, widowed) and number of under-five living children in the family, number of household, house ownership (owned, partially owned, rented, others), No. of rooms, car ownership, mother's and father's educational level, mother's occupation.

When the child has a delay of more than a month from the exact date mentioned in the vaccination schedule, he/she is considered as a defaulter [12].

Statistical analysis

Descriptive data analysis: Data were entered into a computer utilizing the social sciences statistical package (SPSS, version 26).

To compare proportions, the chi square test of association was employed. Fisher's exact test was performed when the predicted frequencies of more than 20% of the table's cells were less than 5. (instead of the Chi square test). A 'p' value of ≤ 0.05 was considered as statistically significant.

Socio economic status

The following equation was used to assess the socio-economic status (SES) of the participants: SES is calculated as follows = education + occupation + home ownership * 0.5 + car ownership * 0.1 + (age-20)/100 − Retired/jobless/deceased [13].

Results

The whole number of the studied sample was 1025 mothers. Their mean age (SD) was 30.4 (6.5) years, the median age was 30.0 years, and the age range was 16 to 45 years. The largest proportion of the sample (26.1%) was aged 30-34 years, and 23.2% were aged 25-29 years. Around one third (32.6%) of the mothers can either read and write or graduates of primary schools, and 91.5% were housewives. The majority (98.3%) of the mothers were married. The largest proportion of the studied sample (44.4%) was having one under five years old child (Table 1).

Table 1: Mothers' basic characteristics

	No	(%)
Mothers' age (years)		
<20	45	(4.4)
20-24	166	(16.2)
25-29	238	(23.2)
30-34	268	(26.1)
35-39	202	(19.7)
≥ 40	106	(10.3)
Mothers' educational level		
Illiterate	188	(18.3)
Primary school or can read and write	334	(32.6)
Intermediate school	120	(11.7)
High school or vocational	124	(12.1)
Diploma (Institute)	82	(8.0)
Bachelor degree or college	164	(16.0)
Master degree or advanced diploma	10	(1.0)
Ph.D. or equivalent	3	(0.3)
Mothers' occupation		
Unskilled occupations	4	(0.4)
Semi- skilled occupations	5	(0.5)
Skilled manual occupations	6	(0.6)
Associated professional occupations	36	(3.5)
Senior managerial or professional occupations	29	(2.8)
Professionally skilled vocations	4	(0.4)
Housewives	938	(91.5)
Students	3	(0.3)
Marital status of the mothers		
Married	1008	(98.3)
Divorced	12	(1.2)
Widowed	5	(0.5)
Number of children under five years old		
1	455	(44.4)
2	393	(38.3)
3	150	(14.6)
4	26	(2.5)
5	1	(0.1)
Total	1025	(100.0)

Around one quarter (24.8%) of the fathers were aged 35-39 years, and the majority (69.2%) were living in urban areas. Around one third (29.7%) of the fathers were graduates of primary schools or can just read and write. Regarding "Fathers' occupation", 39.8% of the fathers were working in unskilled occupations. More than half (62.8%) of the fathers were living in their own house, and 69.9% had a personal car (Table 2).

Table2: Fathers' basic characteristics

	No.	(%)
Fathers' age		
< 25	90	8.8
25-29	230	22.4
30-34	244	23.8
35-39	254	24.8
≥ 40	207	20.2
Residency		
Rural	316	30.8
Urban	709	69.2
Father's educational level		
Illiterate	149	14.5
Primary school	304	29.7
Intermediate school	148	14.4
High school	90	8.8
Diploma or institute	103	10.0
Bachelor degree	200	19.5
Master degree or advanced diploma	18	1.8
Ph.D. or equivalent	13	1.3
Father's occupation		
Unskilled	408	39.8
Semi- skilled	271	26.4
Skilled manual occupation	122	11.9
Associated professional occupations	128	12.5
Skilled professional or senior managerial	84	8.2
Highly skilled professional occupation	12	1.2
House ownership		
Owned	644	62.8
Partially owned	99	9.7
Rented	277	27.0
Others specify	5	0.5
Car ownership		
Yes	716	69.9
No	309	30.1
Total	1025	100.0

It is evident in Figure 1 that more than half (54.2%) of the sample were of low socio-economic status (SES), 32.8% were of medium SES, and only 13% were of high SES (Figure 1).

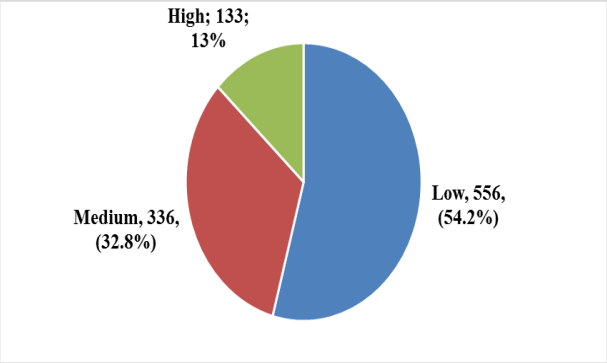

Figure (1): Socio-economic status (SES)

Results showed that more than half (58.4%) of mothers sometime take the baby to health center every time he/she must be immunized, and the majority (94.0%) of mothers never take the baby to health center if any side effect appears. The majority (70%) of the mothers allow the health personnel to vaccinate the baby away from health center. Almost all of the mothers (96.0%) had child immunization card, and 71.0% of them knew the name of the vaccine that had been given to the child (Table 3)

Table 3: Mother's practices regarding vaccination

	No.	(%)
I take my baby to health center every time he/she must be immunized		
Never	45	4.4
Sometime	599	58.4
Always	381	37.2
I take my baby to health center if any side effect appear		
Never	963	94.0
Sometime	40	3.9
Always	22	2.1
I allow the health personnel to vaccinate the baby away from health center		
Never	220	21.5
Sometime	87	8.5
Always	718	70.0
Has your child immunization card		
Yes	984	96.0
No	41	4.0
Awareness about the name of the given vaccine		
Yes	728	71.0
No	297	29.0
Total	1025	100.0

The defaulter rate was 36.2% as presented in Figure 2.

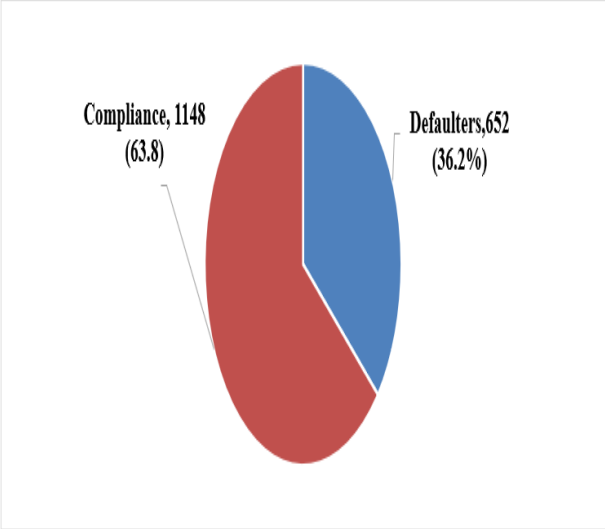

Figure2. Defaulter rate in the studied sample.

The defaulter rate was 60.3% in the rural areas and 24.2% in the urban areas as presented in Figure 3.

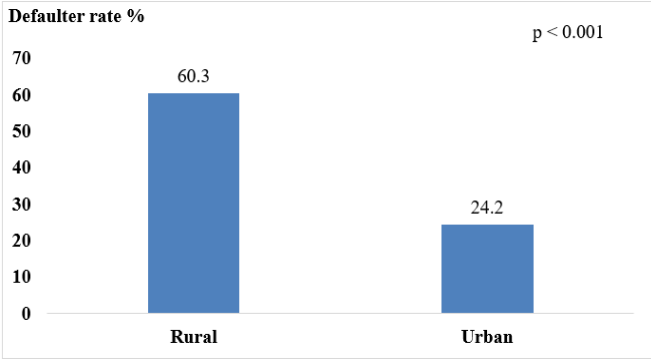

Figure 3: Defaulter rate by residency.

It is evident in Table 4 that, in general, the high defaulter rate was associated with low rank occupations like unskilled and semi-skilled mothers (the rates were 72.7% and 40% respectively), and with low educational levels (52.5% among illiterate mothers, and 43.2% among women who can just read and write or graduates of primary schools) ($p < 0.001$). No significant relationship was discovered between the defaulter rate with age ($p = 0.109$), and marital status of the mothers ($p = 0.515$) (Table 4).

Table 4: Factors associated with the dropout of the children from immunization schedule.

	Defaulter	Compliant	Total	
	No. (%)	No. (%)	No. (%)	p
Mother's age				0.109
< 20	19 (31.7)	41 (68.3)	60 (100.0)	
20-24	88 (35.1)	163 (64.9)	251(100.0)	
25-29	162(37.1)	275 (62.9)	437 (100.0)	
30-34	162(32.4)	338 (67.6)	500 (100.0)	
35-39	144(38.3)	232 (61.7)	376 (100.0)	
≥ 40	77(43.8)	99 (56.3)	176 (100.0)	
Mother's occupation				< 0.001
Unskilled	8(72.7)	3(27.3)	11(100.0)	
Semi-Skilled	4(40.0)	6(60.0)	10(100.0)	
Skilled manual	1(9.1)	10(90.9)	11(100.0)	
Associated professional	12(22.2)	42(77.8)	54(100.0)	
Skilled professional or senior managerial	7(13.2)	46(86.8)	53(100.0)	
Highly skilled professional	0(0.0)	7(100.0)	7(100.0)	
Housewife	618(37.5)	1029(62.5)	1647(100.0)	
Student	2(28.6)	5(71.4)	7(100.0)	
Mother's education				< 0.001
Uneducated	191(52.5)	173(47.5)	364(100.0)	
Primary school or can read and write	259(43.2)	341(56.8)	600(100.0)	
Intermediate school	57(29.1)	139(70.9)	196(100.0)	
High school or vocational	52(26.8)	142(73.2)	194(100.0)	
Diploma(institute)	38(27.5)	100(72.5)	138(100.0)	
Bachelor degree or college	54(19.5)	223(80.5)	277(100.0)	
Master degree or advanced diploma	1(4.0)	24(96.0)	25(100.0)	
Ph.D. or equivalent	0(0.0)	6(100.0)	6(100.0)	
Marital status of the mother				0.515
Married	646(36.4)	1130(63.6)	1776(100.0)	
Divorced	4(25.0)	12(75.0)	16(100.0)	
Widowed	2(25.0)	6(75.0)	8(100.0)	
Total	652(36.2)	1148(63.8)	1800(100.0)	

Discussion

The primary aim of this study was to assess the defaulter rate from immunization among under five years children in Erbil governorate. Up to the researcher knowledge this is the first comprehensive survey in Erbil governorate that compare between the coverage rate in the rural and urban areas.

Mother's practices regarding vaccination: The results showed that more than half (58.4%) of mothers sometime take the baby to health center every time he/she must be immunized. This result is incompatible with the study's result of Alfahl and Alharbi (2017) in Saudi Arabia, they indicated that most parents had good vaccination practices, with 92.8% indicating that their children had received the recommended vaccinations on a regular basis [14] . Many parents would rather not expose their children to additional chemicals since they do not view avoidable diseases as serious or life-threatening [15]. The distance to the immunization location was negatively related to vaccination status. Therefore, it should be thought of building more primary health sub centers (SCs) to enable simple access for all people. Additional outreach immunization clinics can be added to these to serve communities that are difficult to reach. Additionally, developments in physical arrangement, such as paved roads and the availability of public transit, must be evaluated to shorten travel times to vaccination sites, especially for rural areas [16]. And the majority (94.0%) of them never takes the baby to health center if any side effect appears. This result is similar to the study's result of Jawad and Al-Janabi (2019) in Baghdad who mentioned that 84.8% of the mothers never take their babies to the health center after appearance of the adverse reactions of some vaccines [17]. This may be related to the previous experience with the earlier child or due to the explanation of health workers during the session to increase the awareness of the mothers about how to treat the child's condition. The majority (70%) of the mothers allow the health personnel to vaccinate the baby away from health center. This result was consistent with the result of Basrat (2008) in Ethiopia who stated a larger proportion (90%) of the children with under-five years have received polio vaccine during the vaccination campaign to the houses [18]. Almost all of the mothers (96.0%) had child immunization card, this result coincides with a study done in Jordan that demonstrated 97.2% of the mothers had immunization card for the local immunization programs [19]. And 71.0% of them knew the

name of the vaccine that had been given to the child. This result agrees with a study done in Jordan that demonstrated that 86.8% of the mothers were capable to recognize vaccines that are obligatory as per the Local Immunization Program [19]. The defaulter rate in the studied sample was 36.2% (60.3% in rural and 24.2% in urban settings), this is incompatible with the results of two studies done in Indonesia and Kakinada, where they found no significant association between partial immunization and residency [20], [21]. India continues to bear a heavy burden of preventable mortality and morbidity due to missed childhood vaccines. 76% of Indian children aged 12-23 months have received all recommended vaccinations in 2019−2020; state-level, complete immunization proportions ranged from 58% in Nagaland to 91% in Odisha [22]. To reduce premature mortality, it is essential to comprehend the adjustable causes of below immunization in India. While parents frequently use poor healthcare facilities as a justification for not vaccinating their kids. The value of care is identified to be a more relevant measure of health results than the accessibility of health facilities or health personnel, which has been the focus of previous studies [23].

The proximity of a medical institution and its staff was examined in an Indian study, but no impact was discovered on DPT vaccine dropout rates [24]. Numerous studies found that some parents did not perceive vaccination as a key factor in determining the health and wellbeing of their children. Many parents believed that vaccinations were unnecessary as long as their child was healthy and developing normally. Some of them argued that if their ancestors—including themselves, their parents, and their grandparents—lived healthy lives despite not receiving vaccinations, why should their children? [25]. The link between residence and polio vaccine coverage is quite high. Parents in cities immunized their children more than parents in rural areas. This could be related to better immunization services in cities, as well as greater educational achievement and knowledge, which is consistent with previous findings [26].

Factors associated with the dropout of the children from immunization schedule: In general, the high defaulter rate was associated with low rank occupations like unskilled and semi-skilled mothers (the rates were 72.7% and 40% respectively). This finding is in agreement with the study done in Dhaka, they found that there is a significant association between occupation and dropout of EPI vaccination [27]. High defaulter rate was associated with low educational levels (52.5% among illiterate mothers, and 43.2% among women who can just read and write or graduates of primary schools). This result strongly agrees with the study done in India who demonstrated that the education levels of parents were divided into three categories of education level: illiterates, school educated, and college educated: The outcome demonstrates that illiterate parents were connected with partial immunization. The mother's education has an impact on the children's immunization rates, partial immunization is higher when the mother is illiterate [28]. The low educational level of parents certainly had an influence on the rate of EPI vaccination failures and, probably, this low reading ability rate formed a lack of alertness among mothers in respects to the acceptance of vaccination [27]. No significant relationship was discovered between the defaulter rate with age. This correlation is incompatible with the study done in Dhaka (the capital of Bangladesh); they demonstrated that extreme failure occurred among the middle-aged group of moms (26-30 years) [27]. Another study done in Dhaka, where researchers showed that young mothers <25 years are more likely to complete vaccination than older mothers [28]. This difference may be owing to a natural variability or due to changes in sample size and sampling area. Finally there was no association between the defaulter rate and marital status of the mothers ($p = 0.515$). This result is in agreement with the study done in Jordan that demonstrated that there is no association between the social status of the mother and vaccination knowledge/attitude score and practice that have direct affect with the immunization status of the child [19].

Limitations of the Study: Refusal of some families in some quarters like (Saroran, havalan, Manara, Mufty ronaky street, Braity, Zankoo, Azady, Rasty) to make the interview with the researcher because they didn’t have enough time

and they didn't want to participate in the study. And it was difficult to make interviews with mothers from rural area due to the nature, and transportation in addition to the distances away from the center, language was the most important barrier that interferes with the study especially in the rural area because all of them didn't know the Arabic language therefore the researcher needs to translator's help.

Strengths of the study: Up to the researcher knowledge, this is the first comprehensive survey in Erbil governorate that compares between the coverage rates in the urban and rural areas.

Conclusions and recommendations: The rate of defaulters was high, particularly in rural areas. The factors that were associated with high defaulter rate were: Mothers' poor educational levels and low-status employment that are linked to children skipping vaccinations. A home-to-home assessment, immunization campaigns, and a active vaccine surveillance system are advised to reach a near-Hundred percent rate for all vaccines in Iraq. The healthcare system must act right away and offer active immunization programs to avert harmful results. Because the missing immunizations could have long-term effects, it's critical to encourage families to take benefit of any chance to get up lost vaccinations.

Conflict Of Interest : The authors have no conflicts of interest to declare for this study.

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