Prevalence of Incomplete Vaccination Andassociated Factors in Children (2-5 Years) Attending Primary Health Care Centers in Diyala, 2019

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ABSTRACT:
BACKGROUND:
Childhood immunization is one of the most cost-effective interventions in health care delivery.
OBJECTIVE:
Prevalence of vaccinated, partially vaccinated and unvaccinated children (2-5 years) attending Primary Health Care and the possible risk factors for incomplete vaccination among them and to assess mothers' knowledge about vaccination and finding out if it was associated with incomplete vaccination.
PATIENTS AND METHODS:
A cross-sectional survey carried out in three primary health care centers in Khanaqin district/ Diyala Province/ Iraq from the first of March until the end of June /2019. The immunization status of children was obtained from mothers and verified by their vaccination cards and records of vaccinations in the primary health care centers and other information obtained from mothers.
RESULTS:
This study included 242 children with their mothers. Vaccination status; 64.05% of children were vaccinated, 33.47% were partially vaccinated and 2.48% were unvaccinated, and incomplete vaccination was associated with low/poor economic status of the family, children living with one parent or others, long waiting times and poor knowledge of mothers.
CONCLUSION:
Immunization coverage rate fell short for the World Health Organization recommended rate of at least 90%.
KEYWORDS: Immunization, Vaccine, Mother Knowledge, Primary Health Care, Socio-Economic-Status.

INTRODUCTION:

Definition of immunization: Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine, through stimulation of the body's own immune system to protect the person against subsequent infection or disease. Rationale of childhood immunization: Childhood immunization is one of the most cost-effective interventions in health care delivery[1].Unlike therapeutic interventions, vaccines are provided to healthy populations to reduce risk of infection and disease [2]. Preventing disease through immunization benefits all people, resulting in positive health, economic and social yield at global, national and community levels. Immunization is a life-saving intervention, preventing needless diseases, disabilities and deaths[3]. In January 2016, Iraq introduced the inactivated polio vaccine (IPV) as part of our national immunization program. It is given to children at the age of 2 months, 4 months and 6 months. The IPV is introduced as a combination vaccine that contains antigens against polio, diphtheria, tetanus, whooping cough, hepatitis B and Haemophilus influenzae type B (the bacteria that causes meningitis, pneumonia and otitis)[4].

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Table (1.1): National Immunization Schedule for Infants and Children 2015[5]

Age	Type of vaccine
0-1 Week	HepB1 , BCG + OPV0dose
2 Months	HEXA 1,ROTA1 ,PREV13-1+OPV1
4 Months	HEXA2,ROTA2,PREV13-2 + OPV2
6 Months	HEXA3,ROTA3,PREV13-3 + OPV3
9 Months	Measles + VIT A
15 Months	MMR(Measles , Mumps , Rubella)
18 Months	PENTA (DTP+IPV+Hib) OPV + VIT
4-6 Years	TETRA (DTaP +IVP) + OPV + MMR

According to guidelines developed by the World Health Organization, children are considered as fully vaccinated when they have received a vaccination against tuberculosis (BCG), three doses of pentavalent vaccine DPT-HepB-Hib and three doses of polio vaccine, and a measles vaccination by the age of 12 months. Considering this incomplete vaccination can be defined children who missed at least one dose of the eight vaccines before 12 months [6].

OBJECTIVES OF THE STUDY:
The aims of this study were to find out: Prevalence of vaccinated, partially vaccinated and unvaccinated children. The possible risk factors for partial vaccination and unvaccination.Assess mothers' knowledge regarding vaccination and finding out if it was associated with incomplete vaccination. Any association between vaccination status and studied factors including mothers' knowledge.

Methodology:
Study design: A cross-sectional survey.
Study setting: The data were collected from three primary health care centers (PHCCs) in Khanaqin district/ Diyala. The data were collected during a period of four months, from the first of March until the end of June 2019.   The data were collected one to two times weekly, from the (9 AM to 1:00 PM) during the study period.
Sampling technique: A convenient sampling was taken of children aged (2-5) years. Two-year cutoff for age was chosen in the current study because children considered fully immunized if they completed the required schedule of vaccinations during the first 12 months, but they has a chance for caching up with the schedule if they missed some of the doses during the second year of life, so the two years landmark is an important point for getting any vaccines missed in the first year of life [7].
Inclusion criteria: All mothers and their children aged two to five years who attended the PHCC at time of data collection with their vaccination cards.

Data collection tool: The data was collected using a three-part questionnaire:
Part One: Demographic factors included; age, current pregnancy, Socio-Economic-Status, sex of child, living with one or both parents or others, waiting time in PHCC in addition to possible risk factors of parents and children. The calculated SES was compared to the range of the three categories of the socioeconomic index low SES, middle SES, and high SES (designed by Omer and AL-Hadithi)[8]. Waiting time was classified into < 30 min, 30-60 min and >60 min, adopted from Al-Kazrajy and Hattat[9].
Part Two: immunization status of children: The immunization status of children was obtained from mothers and verified by their vaccination cards and records of vaccinations in the PHCC, and then classified into three groups adopted from Al-Kazrajy and Hattat[9], as shown in Appendix I. Vaccinated: A child had completed all vaccines according to Iraqi national immunization program.Partially vaccinated: A child has not completed his vaccinations up to date.Unvaccinated: A child who had never received any vaccine. For purpose of valid statistical comparison partially vaccinated   group and unvaccinated group added together for sub categorical analysis.
Part three: Mothers' knowledge of immunization, which was validated by previous related studies[10,11], as shown in the Appendix II, with a total of 10 questions, each one with either correct, incorrect or don't know answers, a score of "1" was given to correct answers and "0" for incorrect/don't know answers, and the total scores was calculated in such way that poor knowledge <50%, fair 50-70%, and good ≥70%.
Statistical analysis: The collected data was handled and analyzed by SPSS (Statistical Package for the Social Sciences) Statistics Version 23. Chi-square was the test used for analyzing categorical data, with Fisher's Exact test when needed. Binary logistic regression models were formulated to predict factors increasing

the risk for incomplete vaccination; all analyses were done with 95% confidence intervals (CI). P-values less than 0.05 were considered statistically significant throughout this study.
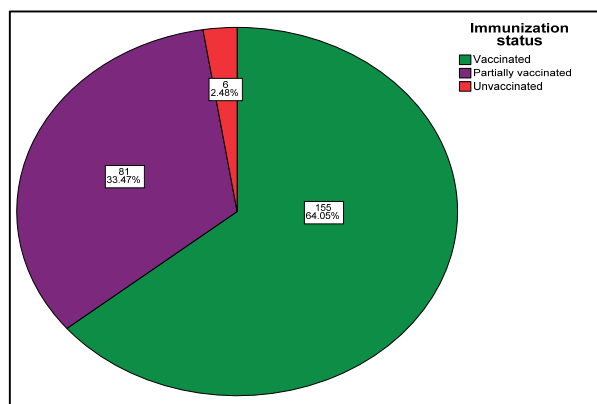
RESULTS:

This study enrolled 242 Mothers, 45.9% of them had an age range of 18-40 years, 30.2% were pregnant, 46.7% had 1-2 children of them 51.2% were females and 90.9% living with their parents, 37.6% had a fair SES, and 45.9% waited 30-60 minutes in PHCCs before completing vaccination (Table1.2), and regarding vaccination; 64.05% of children were vaccinated, 33.47% were partially vaccinated, and 2.48% were unvaccinated, as illustrated in Figure (1.1).

Table (1.2): Basic characteristics of mothers and children

Variables	Number	%
Age groups		
< 18	71	29.3
18-40	111	45.9
>40	60	24.8
Current Pregnancy		
Yes	73	30.2
No	169	69.8
Number of children		
1-2	113	46.7
3-4	93	38.4
≥5	36	14.9
Socioeconomic status		
Poor	56	23.1
Fair	91	37.6
Good	74	30.6
High	21	8.7
Sex of the child		
Male	118	48.8
Female	124	51.2
Child live with		
Both parents	220	90.9
One parent	20	8.3
Others	2	0.8
Waiting time		
< 30 min	91	37.6
30-60 min	111	45.9
> 60 min	40	16.5

Figure (1.1): Distribution study sample according to immunization status of children.
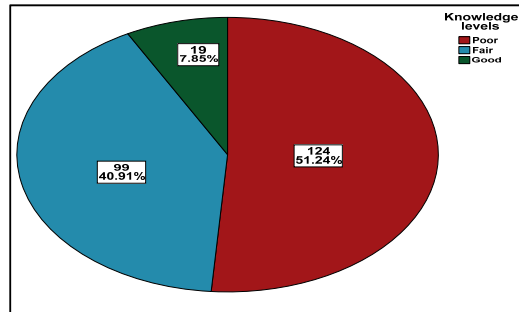
Figure (1.2): Distribution of sample according to mothers Knowledge levels of immunization.

Incomplete vaccination was not associated with mothers' age, current pregnancy, number of children, or sex of the child, but it was associated with low/poor economic status of the family (42.9% of low and 61.5% of poor SES had incomplete vaccination), children living with one parent or others (59.1% of those living with one parent/others were incompletely vaccinated), and long waiting times (45% of those waited more than 60 min were incompletely vaccinated), as shown in Table (1.3).

Table (1.3): Association between immunizations status and basic characteristics of the study group.

Variables	Number	%
Age groups		
< 18	71	29.3
18-40	111	45.9
>40	60	24.8
Current Pregnancy		
Yes	73	30.2
No	169	69.8
Number of children		
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> 60 min	40	16.5

Incomplete vaccination was associated with knowledge levels, as 59.7% of those with poor knowledge levels had children with incomplete vaccination, as shown in Table (1.4).

Table (1.4): Association between immunizations status and mother's knowledge.

	Complete	Incomplete	P-value
Variables	No. (%)	No. (%)	
Knowledge levels			
Poor	50(40.3)	74(59.7)	<0.001
Fair	69(69.7)	30(30.3)	
Good	12(63.2)	7(36.8)	
¶Chi-square test			

Further analysis using binary logistic regression revealed that low SES significantly increase the risk for incomplete vaccination by 3.75 times compared to good SES level, while poor SES increased the risk by 8.79 times compared to good, while no significant risk difference between fair and good SES, and children who lived with one parent had 2.78 times increased risk for incomplete immunization, in addition > 60 min waiting times were associated with increased risk for incomplete vaccination by 2.73 times compared to <30 min waiting, and 2.54 times compared to 30-60 min waiting, as shown in Table (1.5). Poor knowledge increased the risk by 3.76 times compared to good levels, as shown in Table (1.6).

Table (1.5): Binary logistic regression model predicting risk stratification for incomplete immunization regarding based on mothers and children basic characteristics.

		95% CI		
Variables	Odd's ratio	Lower	Upper	P-value
Economic status	-	-	-	-
Low compared to good	3.75	1.09	14.55	0.036
Poor compared to good	8.79	2.36	32.68	0.001
Fair compared to good	0.35	0.07	1.73	0.197
Waiting time	-	-	-	-
>60 min compared to <30 min	2.73	1.24	6.02	0.013
>60 min compared to 30-60 min	2.54	1.37	4.70	0.003
Children live with one parent	2.78	1.02	7.56	0.046

Table (1.6): Binary logistic regression model predicting risk stratification for incomplete immunization regarding mothers' knowledge.

Variables		95% CI		
	Odd's ratio	Lower	Upper	P-value
Knowledge level	-	-	-	-
Poor compared to fair	1.48	0.87	2.51	0.147
Poor compared to good	3.758	1.562	8.254	<0.001

DISCUSSION:

Maintaining a successful coverage of immunization in Iraq is not an easy or straightforward mission, because of the unpredictable and insecure situation in our country[12] and some of these difficulties could be overcome if there was a strong collaboration and trust between parents and the primary health care system[13]. In the current study, 64.05% of children were vaccinated, 33.47% were partially vaccinated, and 2.48% were unvaccinated.

These figures were lower compared to the Ministry of Health annual statistical report in 2017, as it was reported that BCG immunization target achieved 103% in Diyala, 99.67% for DPT, 71% for Rota, 99% for Hexa, 59.3% for pneumococcal, 100% for both BCG and hepatitis B virus [14]. Our results were comparable to results of a study done in Diyala/ Iraq by Mahmoud NS (2012), who enrolled 259 children and investigated their status of vaccination and reported that 70% were

fully vaccinated, 24% partially vaccinated and 6% were unvaccinated[15]. Regarding knowledge of mother toward vaccination, our results had some similarities with results of Al-Ghamdi et al who investigated 400 parents regarding vaccination knowledge, practice and attitudes and reported that 81% agreed that it prevents infectious disease and their complications, 74.7% agreed that vaccination is safe, 45.8% believed that vaccination had dangerous side effects, 50% of parents mentioned that fever always develop after vaccination, 32.9% mentioned that swelling and 16.6% mentioned pain at vaccination site[16]. In the current study, incomplete vaccination factors were comparable to results of Alrowaili et al (2019) in Saudi Arabia who studied social factors associated with delayed vaccination, and reported that it was associated with unemployed housewife mothers, parents didn't finish college, children older than one year, and being the 3rd or 4th in order of birth [17]. This was not concordant with results of Adil et al (2009) in Pakistan who reported that vaccination status was not related to family income, rather associated with parent knowledge about the name and date of scheduled vaccines[18].

CONCLUSION:
1. Complete immunization rate was 64.05% which fell short for the WHO recommended rate of at least 90%.
2. Majority of mothers had poor and fair knowledge.
3. Poor and fair mother knowledge, low SES, long waiting time at PHCC and child not living with both parents could be risk for incomplete vaccination.

Recommendations:
1. Continuous monitoring for vaccination coverage in different parts of Diyala province to ensure future increase in coverage, thus improving rates of vaccination.
2. Coverage of remote areas and possibly areas with low SES, with ambulatory vaccination campaigns for field vaccination of children in those areas.
3. Improve settings in (PHCC) especially waiting time like increase number of immunization units, number of staff in units, further studying should be done regarding immunization status of children living with one parent and possible ways for improving it.
4. Ensuring adequate parental education about vaccination and vaccine preventable disease to decrease possible barriers towards vaccination.

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