Immunization Coverage and its determinants in Children Aged 12-23 Months in Basrah

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ABSTRACT

Background: **Immunization is one of the most important programmes which contributed to the prevention of major childhood diseases. A high coverage rate is desirable for the effectiveness of this programme.**

Objectives: **This study aimed to assess the level of immunization coverage rate among children aged 12 to 23 months in Basrah during 2014-2015. Also, to explore the vaccination dropout rate and the causes of partially immunization.**

Methods: **A cross sectional survey was done in 30 clusters that followed the World Health Organization cluster sampling technique. Data were collected via direct interview with 300 mothers using an Arabic language questionnaire and the data were analyzed using SPSS programme.**

Results: **The vaccination coverage rate in this study was 80.7% and the dropout rate was 19.3%, which is rather high while the main causes of the dropout were difficulties facing mothers' attendance to Primary Health Care centers (50%) and lack of information (31%).**

Conclusions: **The results of the current study showed that although the coverage rate of immunization was adequate, the dropout rate was high and the important reasons for that were inadequate awareness and inconvenience timing for mothers. In addition, literacy status and occupation of mothers, child birth order and family type were other reasons.**

Key words: **Immunization, coverage, dropout, cluster sampling, Basrah.**

تغطية اللقاحات ومحدداتها عند الاطفال من عمر ١٢-٢٣ شهر في محافظة البصرة

الخلفية: يعتبر برنامج التلقيحات احد أهم البرامج التي ساهمت بالوقاية من أمراض رئيسية بين الأطفال، وتحتاج فعالية البرنامج إلى نسب تغطية عالية.

هدف البحث: يهدف البحث إلى تقييم نسبة تغطية لقاحات الأطفال بعمر ١٢–٢٣ شهرا في محافظة البصرة خلال سنتي ٢٠١٤ و٢٠١٥ وكذلك لاستكشاف نسبة تسرب الأطفال من اللقاحات وأسبابها.

طرق البحث: دراسة مقطعية عرضية شملت ٣٠ عنقودا حسب تقنية العينات العنقودية لمنظمة الصحة العالمية وقد جمعت البيانات عن طريق أجراء مقابلة شخصية مباشرة مع ٣٠٠ من الأمهات باستخدام استبيان باللغة العربية وتم تحليل البيانات باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية.

النتائج: كانت نسبة تغطية اللقاحات في هذه الدراسة ٨٠.٧% وأعلى نسبة للتسرب هي ١٩.٣% بينما كانت الأسباب الرئيسية لهذا التسرب هو التحديات والمصاعب اللوجستية التي تواجه الأمهات (٥٠%) وشحة المعلومات المناسبة عند الأمهات (٣١%)

الاستنتاجات: بينت نتائج الدراسة الراهنة أن مستوى تغطية اللقاحات كان مناسبا ومع ذلك فقد كانت نسبة التسرب عالية نسبيا وأن أهم أسباب تسرب الأطفال هو المصاعب التي تواجه الأمهات وقلة وعيهن. كما أن علاقة مستويات تعليم ووظائف الأمهات وتسلسل الطفل ونوع العائلة مع تغطية لقاحات الأطفال لها دلالة إحصائية.

الكلمات المفتاحية: التلقيح، تغطية، التسرب، عينة عنقودية، البصرة

INTRODUCTION

Immunization is often cited as being one of the greatest public health achievements of the 20th century.[1,2] Effective immunization requires population coverage levels of 90 to 95% depending upon the vaccine-preventable disease.[3] The coverage is estimated by the late

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vaccine doses achieved among children in the first year of their age. [4,5] Historically, in May 1974, the 27th World Health Assembly resolved to build on the success of the smallpox eradication programme and established the Expanded Programme on Immunization (EPI) to ensure that all children, in all countries, benefited from life-saving vaccines.[5] Increased knowledge of the immunological factors of disease led to new vaccines being developed and added to the EPI's list of recommended vaccines. [6] In1985, EPI was well established in Iraq delivering immunization services to targeted groups.[7] It is estimated that EPI averted 2 million deaths in 2003 in the world. [8] Assessing immunization coverage helps to evaluate progress in achieving programme objectives and in improving service delivery. [8] In addition, evaluation of immunization coverage provides evidence whether substantial progress towards achieving vaccination targets is being made.[9] Vaccination coverage is defined as the proportion of a given population that has been vaccinated in a given time period. It is estimated for each vaccine and, for multi-dose vaccines, for each dose received (e.g., diphtheria-tetanus-Pertussis-containing vaccine (DTP1, DTP2)). It is usually presented as a percentage out of targeted children.[8] The capacity of the health system to complete the immunization course for a child is estimated based on the dropout rate indicator between the first dose and the last dose of the vaccine at first year of age of the children. The maximum acceptable dropout rate is 10%. Globally, higher rates indicate inefficiency of the health service, service discontinuity at fixed posts, lack of information to mothers about returning for the follow up doses and a lack of subsequent visits by outreach or mobile teams.[10] Marital status, sex, and possessing of children card were other contributing factors of dropout rates.[11] Immunization programmes are monitored using two methods: an administrative institution-based method and through community-based surveys. [12] This study aimed to assess the level of immunization coverage rate among children aged 12 to 23 months in Basrah during 2014-2015. Also, to explore the vaccination dropout rate and the causes of partial immunization.

METHODS

Study design

A community-based cross sectional descriptive survey with a multistage sampling technique was conducted in Basrah province during the period between 3rd and 14th of April, 2016 on 30 randomly selected clusters, where 300 children (10 for each cluster) aged 12-23 months were studied for vaccination coverage.

Study population

According to Ministry of Planning 2015, the estimated total population of Basrah province was 2,818,000 and the target population for routine immunization was 418,000 (14% of total population). [13]

Sample size

The minimum sample size of 300 children was estimated following the standard procedure for using WHO cluster sampling for assessment of immunization coverage. [12] A total of 30 clusters in the community were demarcated based on its population and sector-wise distribution.

Sampling technique

In the first stage, all the eight administrative districts in Basrah were included. In the second stage, a list of the settlements in each of the district was obtained and 30 of settlements were selected randomly (each settlement was taken as a cluster). The third stage involved the selection of households; the first household was selected randomly in each cluster and every next household was studied in a sequence, until a total of 10 eligible children in the age group of 12–23 months were covered. On reaching the selected household, the mother of the eligible child was interviewed. If no child belonging to the target population was found, next

households were checked till an eligible child was found.

Data collection

Data collection was carried out by direct interview with mothers using a modified Arabic form of validated WHO sample research questionnaire on EPI and an interview guide to collect information regarding socio-demographic parameters, status of immunization of children, and reasons for non-adherence. Age of children and status of immunization were confirmed by vaccination cards and they were determined as:

Complete Immunization for the purpose of this study: Children have received Bacillus Calmette-Guerin (BCG), Measles, and three doses of DPT, hepatitis B, and Oral Polio Vaccine (OPV) each.

Partial/Incomplete Immunization: Children who have received at least one (but not all) of the above mentioned vaccines.

Unimmunized Children*:* Children who have not received any vaccine.

Ethical issues

Permission was taken from Basrah Health Directorate and a verbal consent was obtained from the participants. Mothers of children who were found not immunized were advised to complete the immunization schedule.

Data management

The obtained data were analyzed with SPSS version 19.0. In testing for associations, cross tabulation was done and chi- squared or Fisher Exact Fisher Test has been used for qualitative variables. The level of significance was established at P-value ≤ 0.05.

RESULTS

The respondent mothers were mostly in the age category between 21-30 years. Illiteracy appeared in considerable proportion (12.3%) among mothers. However, graduates exceed this level (14.0%). Seventeen percent of the respondents were employed. The rest were essentially housewives and 65% of families were multigenerational house (Table-1).

Table 1. Socio-demographic characteristics of mothers (n = 300).

Characteristics	No.	%
Age group (years)		
≤ 20	32	10.7
21 -30	168	56.0
31 – 40	72	24.0
≥ 41	28	9.3
Level of education		
Illiterate	37	12.3
Primary	57	19.0
Intermediate	63	21.0
Secondary	101	33.7
Graduate and higher	42	14.0
Occupation		
Unemployed (housewife)	247	82.3
Employed	53	17.7
Family type		
Single generation	105	35.0
Multigeneration	195	65.0

The study included 300 children with equal male: female ratio. The order of the involved children is essentially equally distributed from first to more than 4th. Health facility deliveries of the children in the sample represent 62% (Table-2).

Table 2. Socio-demographic characteristics of children (n = 300).

Characteristics	No.	%
Mean age ± SD (months) = 18.4 ± 3.2		
Gender		
Male	149	49.7
Female	151	50.3
Child birth order		
1st	73	24.3
2nd	79	26.4
3rd	73	24.3
4th +	75	25.0
Place of delivery		
Health facility	186	62.0
Outside health facility	114	38.0

Hundred percent of the sample received at least one dose of vaccines. However, completed coverage was 80.7% (Table-3-A). Vaccines of the early life (BCG, OPV0, and HepB1**)** were fully received by all children. Vaccination coverage declines with subsequent doses until it becomes 80.7% when the turn of measles vaccines ensues (Table-3-B).

Table 3. Immunization coverage.

A. Overall immunization status	**No. Children**	**% coverage**
Complete	242	80.7
Partial	58	19.3
Unimmunized	0	0
Total	300	100
B. Type of vaccine		
BCG, OPV0, HepB1	300	100
DTP1, OPV1,HepB2	291	97.0
DTP2, OPV2	272	90.7
DTP3, OPV3, HepB3	257	85.7
Measles	242	80.7

Mother's age, gender of the child and place of delivery do not seem to have an influence of the coverage rate of vaccination. On the other hand, mother's education, mother's occupation, family type and birth order of the child affected coverage (Table-4).

Table 4. Association of socio-demographic characteristics with state of immunization (n=300).

Characteristics	**Complete Immunization No. (%)**	**Partial Immunization No. (%)**	**Chi-Square Test / Fisher Exact Test**	**P-Value**
Mother' education				
Illiterate (n = 37)	5(13.5)	32(86.5)	**16.60***	**0.001**
Primary (n = 57)	34(59.6)	23(40.4)		
Intermediate (n = 63)	60(95.2)	3(4.8)		
Secondary (n = 101)	101(100)	0(0)		
Graduate (n = 42)	42(100)	0(0)		
Mother's occupation				
Unemployed (n = 247)	189(76.5)	58(23.5)	**15.42***	**0.001**
Employed (n = 53)	53(100)	0(0)		
Family type				
Single generation (n = 105)	92(87.6)	13(12.4)	5.07	0.01
Multigeneration (n = 195)	150(76.9)	45(13.1)		
Child birth order				
1st (n = 73)	66(90.4)	7(9.6)		
2nd (n = 79)	67(84.8)	12(15.2)	11.31	0.01
3rd(n = 73)	51(69.8)	22(30.2)		
4th + (n = 75)	58(77.3)	17 (22.7)		

***Fisher Exact Test**

Causes of failure to complete immunization schedule were segregated into three categories: Obstacles (50%), lack of information (31%) and lack of motivation (19%) (Table-5).

Table 5. Reasons responsible for partial immunization (n = 68).

Reasons	No.	%	Total No. (%)
Obstacles			29 (50.0)
Mother too busy	16	27.6	
Place of immunization too far	3	5.3	
Child ill	5	8.6	
Long waiting time	2	3.4	
Family problem including illness of mother	2	3.4	
Vaccine not available	1	1.7	
Lack of information			18 (31.0)
Unaware of need of immunization	9	15.5	
Unaware of need to return for 2nd or 3rd dose	5	8.6	
Fear of side reactions	4	6.9	
Lack of motivation			11 (19.0)
Postponed until another time	8	13.7	
Not faith in immunization	3	5.3	

Further analysis showed that access to immunization is allowed to 97% of the reported children. Dropout from DPT1 to Measles is 16.8% compared to that from BCG to Measles (19.3%) and ending with coverage of 80.7% revealing a modest utilization problem. None of the children was found to have zero immunization.

DISCUSSION

Immunization, a component of primary prevention, plays a pivotal role in the prevention of a number of diseases affecting children, the most vulnerable population. Improvement in the immunization status not only enhances the health of the people but also the economic stability of the country.[8] The World Health Organization (WHO) states that by 2020, coverage of target populations should reach at least 90% national vaccination coverage and at least 80% vaccination coverage in every district or equivalent administrative unit for all vaccines in national immunization programmes.[14] Although the immunization coverage target (90%), according to WHO regulation, is not attained in this study, it was fairly satisfactory as compared to general coverage rate in Iraq 2013 where the vaccination coverage was 63%.[8] One of the strengths of this study is that the immunization status of each subject was confirmed by immunization cards. The use of immunization cards to assess coverage is necessary to verify the immunization status of a child as both over and underestimation are possible depending on the maternal tendencies exhibited with regards to immunizations. [15]

Reports show that some developing countries have achieved optimal immunization coverage, while others are making great strides in doing so.[16] The consequence of suboptimal immunization coverage is low herd immunity with continued circulation of vaccine preventable diseases in the community. Herd immunity is improved by immunizing eligible children in the community and this subsequently results in lower incidence of vaccine preventable diseases[17]. There were variations in the coverage rate for individual vaccines. It is noteworthy that three of the antigens (BCG, OPV0, and HepB1) recorded100%, while (DTP1, OPV1, and HepB2) recorded 97% and DTP2,OPV2 recorded 90%.The proximity of the time of delivery to the vaccine schedule for obtaining the earlier vaccines may explain the high rates of coverage for these vaccines. The lowest coverage rates were recorded for DTP3, OPV3, HepB3 (85.7%) and Measles vaccine (80.7%) reflecting poor compliance for vaccines scheduled for administration later in infancy. Generally, these levels are more than the national figures.[8,9] Dropout rates were also measured to determine immunization programme continuity showing the number of the children who start but fail to complete the immunization process. All dropout rates between different vaccines groups were above the accepted level 10%.[8] The high and variable dropout rates between vaccines may be related to the presence of obstacles encountered by 50% with the commonest obstacle to immunization being mother too busy (27.6%). Mothers also need to be educated on the importance of immunization and the need for subsequent doses of vaccines, as lack of information (31%) was also an important reason for incomplete immunization. These factors were studied in a similar setting in India and revealed identical causes of dropout except a cause of the child being ill.[1] Concerning socioeconomic factors that predict immunization coverage, it was observed in this study that mothers with some education were more likely to have fully immunized their children compared with those that had no formal education. Similar result was found by Vikram 2012.[19] Higher immunization coverage was also more common among children of employed mothers. The female literacy level in the study population was low as about one third of the mothers had either no formal education or just can read and write. This is higher than the nationally detected figure of 22% of illiteracy by Iraq Women Integrated Social and Health Survey.[19] The female literacy level in a community needs to be optimal as educated mothers utilize child health services better (including immunization) and this has been linked positively with child survival. Children from single generational families were more likely to complete immunization than those from multigenerational homes and children of the 1stand 2nd birth order than those of 3rdorder and above. Several studies have corroborated findings of a larger family size and later birth order as being associated with poor immunization status of children. This may be related to socioeconomic and domestic pressures of a large family due to time pressures and cost of transportation for each immunization for each child, especially if health care facilities are not in close proximity.[1, 10, 18]

In conclusion, the rate of immunization of the children was adequate and there was significant association between literacy status and occupation of mothers, child birth order and family type with the immunization status of children. The probable reasons of partial immunization were inadequate awareness and inconvenience for mothers. Measures which are likely to improve and maintain high coverage rate include, health education, improvement of female education, reminders of timing and outreach follow up of dropped out children. In addition, periodic household surveys are useful means to support the EPI.

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