

# Coverage of and barriers to routine child vaccination in Mukalla district, Hadramout governorate, Yemen

A.A. Ba'amer<sup>1</sup>

## التغطية بالتطعيم الروتيني للأطفال والعوائق أمامها في منطقة المكلا، محافظة حضرموت، اليمن أبو بكر أحمد باعامر

الخلاصة: أجرى الباحثون مسحاً مركزاً على المجتمع للتعرف على التغطية بالتمنيع لدى الأطفال في عمر 12-23 شهراً، وللتعرف على أسباب عدم التطعيم، وذلك في مديرية المكلا، محافظة حضرموت، اليمن. وقد جمع الباحثون معلومات عن الوضع التمنيعي وعن العوائق المتعلقة به لدى 210 طفلاً؛ وقد وجدوا أن (82%) قد تلقوا تطعياً كاملاً، وأن (12%) قد تلقوا تطعياً جزئياً، وأن (5%) لم يتلقوا أي تطعيم. وقد وجدوا أيضاً أن معدل التخلف عن تلقي الجرعة الأولى والثالثة من اللقاح الثلاثي (الحنانق والسعال الديكي والكزاز) (3.1%). وعندما ضم الباحثون البيانات المتحصلة من بطاقات التطعيم ومن الاستماع لقصص الأبوين، كانت التغطية بالجرعة الأولى من اللقاح الفموي لشلل الأطفال (94.3%)، وبالجرعة الثالثة من اللقاح الفموي لشلل الأطفال (91.4%)، ولقاح الحصبة (90%)، والبي سي جي (88.1%). أما أسباب عدم التطعيم فتشمل نقص المعلومات في (54%) ووجود عوائق لدى (35%). وتوجد حاجة لرفع مستوى وعي العائلات حول التطعيم ولتوسيع مدى النشاطات الإيصالية لتغطية جميع الأطفال.

ABSTRACT To determine the vaccination coverage for children 12-23 months and to identify reasons for non-vaccination, we conducted a community-based survey in Al Mukalla district. Information about vaccination status and related barriers was collected for 210 children: 82% were fully vaccinated, 12% were partially vaccinated, and 5% were not vaccinated. Drop-out rate between DPT1 and DPT3 was 3.1%. Combining the evidence of vaccine cards and parent's history, the coverage for OPV1 was 94.3%, OPV3 91.4%, measles 90%, and BCG 88.1%. Reasons for not vaccinating included lack of information (54%) and existence of obstacles (35%). There is a need to raise the awareness of families about vaccination and to expand continuous outreach sessions to cover all children.

## Couverture de la vaccination des enfants et obstacles relatifs à celle-ci dans le district de Mukalla (gouvernorat d'Hadramout, Yémen)

RÉSUMÉ Afin d'évaluer la couverture vaccinale des enfants âgés de 12 à 23 mois et d'identifier les raisons de la non-vaccination, nous avons conduit une étude communautaire dans le district d'Al Mukalla. Les informations relatives au statut vaccinal et aux obstacles qui s'y rapportent ont été réunies pour 210 enfants : 82 % d'entre eux étaient complètement vaccinés, 12 % l'étaient en partie et 5 % ne l'étaient pas. Le taux d'abandon entre la première dose du vaccin antidiphthérique-antitétanique-anticoquelucheux (DTCI) et la troisième dose de ce vaccin (DTC3) était de 3,1 %. D'après les fiches de vaccination et les antécédents familiaux, la couverture vaccinale était de 94,3 % pour la première dose du vaccin antipoliomyélique oral (VPO1), de 91,4 % pour la troisième dose (VPO3), de 90 % pour le vaccin antirougeoleux et de 88,1 % pour le vaccin par le bacille de Calmette-Guérin (BCG). Les raisons de la non-vaccination étaient notamment le manque d'informations (54 %) et l'existence d'obstacles (35 %). Il est nécessaire d'améliorer la sensibilisation des familles sur la vaccination et d'étendre les séances périphériques permanentes afin d'offrir une couverture vaccinale à tous les enfants.

<sup>1</sup>Community and Family Medicine Department, Faculty of Medicine and Health Sciences, Hadrmout University for Science and Technology, Al Mukalla, Hadrmout, Yemen (correspondence to A.A. Ba'amer: aabaamer@maktoob.com).

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## Introduction

Vaccines are one of the greatest achievements in medicine and public health, greatly reducing morbidity, mortality and health care costs. Despite spectacular recent progress, vaccination has not reached its full potential. At least 2 million people die every year from diseases preventable by vaccines recommended by the World Health Organization (WHO) [1]. Many developing countries have also seen major accomplishments in disease prevention because of the sustained use of vaccines. Yet, in order for vaccination programmes to be effective, high rates of coverage must be maintained. Even in countries like the United States of America, which have very successful programmes, coverage is often suboptimal in some geographic areas and sociodemographic groups [2].

In response to challenges in global immunization, WHO and UNICEF developed the Global Immunization Vision and Strategy, 2006–2015 (GIVS). One of the set goals of GIVS for any country is to reach at least 90% national vaccination coverage and at least 80% vaccination coverage in every district or equivalent administrative unit [3]. Local measurement of vaccination coverage is useful to identify pockets of low-coverage susceptible to outbreaks, and to determine special interventions needed to improve local coverage.

The Expanded Programme on Immunization (EPI) in Yemen is part of the Primary Health Care General Directorate in the Ministry of Public Health and Population. The goal of EPI is to prevent morbidity and mortality caused by diseases preventable through vaccination. The target groups are infants and women of child-bearing age. The recommended vaccination schedule includes vaccines against tuberculosis, poliomyelitis, measles, diphtheria, pertussis, hepatitis B, and diseases caused by *Haemophilus influenzae*. The goal of the EPI in Yemen is to achieve 90%

coverage for OPV3, DPT3, and measles and to achieve 80% coverage for hepatitis B3 before the age of 12 months by the end of 2005.

The coverage of infants in 2005 in Yemen with BCG, OPV3, DPT3 and measles vaccines was 66%, 87%, 86%, and 76% respectively [4]. Epidemics of measles and poliomyelitis have occurred in recent years. In 2005–2006 in Hadramout governorate, 7 cases of poliomyelitis occurred, 2 in Al Mukalla city district. The vaccination coverage of infants in Al Mukalla city district in 2004 was 66.5%, 108.0%, 95.9% and 96.4% for BCG, OPV3, HBV3 and measles respectively [5].

This study was carried out to determine the vaccination coverage for children 12–23 months in Al Mukalla city district, and to identify the reasons for non-vaccination.

## Methods

Al Mukalla city district, the study area, includes Al Mukalla city and 10 surrounding villages. It is the capital of Hadramout governorate, which is in the south-eastern part of Yemen. The population of the district was estimated at 186 896 in 2005 [6]. Twelve health facilities (4 mother and child health centres and 8 health units) in the district provide vaccination to children and women of childbearing age in addition to other preventive and curative health services.

The survey was conducted according to the standard method as a 30-cluster survey [7]. The sample size estimated according to this method was 210 (7 children in each cluster). For the calculation, desired precision was 10%, confidence level was 95%, design effect was 2 and expected vaccination coverage was 50%–95%.

Thirty clusters were randomly chosen from the 106 administrative divisions of the district, which were created

for the purposes of the EPI national immunization days implemented in recent years, especially for Oral Polio Vaccine (OPV).

Door-to-door visits and face-to face interviews were conducted with parents or guardians of children 12–23 months old (at the time of the survey) until 7 eligible children were found for each cluster. During the household visits, we used 2 forms which were designed to obtain information from families on their children's vaccination status. Variables in Form 1 included cluster number, child's name, date of birth, sex, and type, dose and date of each vaccine. Form 2 included the reasons for any partial vaccination or non-vaccination of the child.

Data collection was done by a group of trained 3rd year medical students during the period 9 February–15 March 2006. The information about vaccination history was taken from the child's parent (or care-giver) if the vaccination card was unavailable (could not be found at the time of the interview, or lost). The interviewers were instructed and trained to get information in cases where there was no card by asking about the number of doses, route, and site of the particular vaccine. According to that information, they could judge the reliability of the vaccination history.

*Epi-Info* 2002 was used for data entry and analysis. To determine the vaccination status of the child, the analysis was done in steps. First we calculated the coverage with each vaccine according to the history, the information on the vaccination card and the vaccine validity. For the dose to be valid, the interval between doses had to be greater than a defined minimum and the dose had to be administered after a defined minimum age according to the standard criteria of the national EPI programme:

- Minimum age for DTP1, OPV1, HBV1, pentavalent1: 6 weeks

- Minimum age for measles and the third dose of HBV: 38 weeks
- Minimum interval between first and second doses of DTP or OPV or HBV or pentavalent vaccine: 4 weeks
- Minimum interval between second and third doses of HBV: 28 weeks

Finally, the numbers of partially and fully vaccinated children were determined according to the history, card evidence and vaccine validity.

A child was considered fully vaccinated if he/she had: 1 dose of BCG, 1 dose of measles, 3 doses of OPV (excluding OPV zero, which is given immediately after birth) and either 3 doses of DPT plus 3 doses of HBV or 3 doses of pentavalent vaccine.

A child who was not fully vaccinated but had had at least 1 dose of any vaccine was considered partially vaccinated.

The reasons for non-vaccination or partial vaccination were classified (according to the standard form) into 3 categories: lack of information, lack of motivation, and obstacle [7].

## Results

Data were collected from 210 children aged 12–23 months. All families in the selected households were cooperative and willing to answer questions about the vaccination of their children and to show available vaccination cards to the interviewers. The mean age of the children was 18 (standard deviation 3.4) months. Cards had been retained by 140 (66.7%). Combining the evidence of the cards and parents' history, vaccination coverage for OPV1, OPV3, measles1 and BCG, was 94.3%, 91.4%, 90.0% and 88.1% respectively. Coverage for children who had a card was greater than overall coverage for each vaccine (Table 1).

Table 2 shows the number of valid doses (by card evidence). Applying all 3 dose validity criteria, there were only 114 valid doses out of 139 OPV1 doses

**Table 1 Crude vaccination coverage of children according to the vaccination card and history, Al Mukalla, Yemen 2004–05**

Vaccine	Card (n = 140)		Card + history (n = 210)	
	No.	%	No.	%
BCG	130	92.9	185	88.1
DPT1/HBV1	131	93.6	190	90.5
DPT2/HBV2	130	92.9	186	88.6
DPT3	128	91.4	184	87.6
HBV3	126	90.0	182	86.7
OPV1	139	99.3	198	94.3
OPV2	138	98.6	194	92.4
OPV3	136	97.1	192	91.4
Measles1	134	95.7	189	90.0
Measles2 <sup>a</sup>	33	23.6	46	21.9

<sup>a</sup>Given at age 18 months; 95 of the 210 children were aged under 18 months.

received, only 100 valid doses out of 136 OPV3 doses received, and only 99 doses were valid out of 134 measles1 doses received.

The number of fully vaccinated children was 173 (82.4%), 120 according to vaccination cards and 53 from history evidence; 26 (12.4%) children were partially vaccinated and 11 (5.2%) were not vaccinated (Table 3).

The drop-out rate between DPT1 and DPT3 was 3.1%, between DPT1 and measles 1 was 0.5%.

Median age at the time when given BCG, DPT1, DPT2, DPT3 and measles was 11.8 weeks, 7.4 weeks, 12.8 weeks, 18.6 weeks and 39.6 weeks respectively.

The main reasons given by the parents of the 37 children for not vaccinating or partially vaccinating them were: unaware of need for vaccination, place or time of vaccination session unknown, and place too far (Table 4).

## Discussion

The proportion of children with vaccination cards (vaccination card retention) in this survey (66.7%) was lower than that (69.2%) in the Yemen Demographic and Mother and Child Health Survey (YDMCHS) in 1997 [8], and higher than that in the UNICEF survey

**Table 2 Valid vaccination coverage of children according to the vaccination card, Al Mukalla, Yemen, 2004–05**

Dose	Valid dose criteria				Total doses by card (n = 140)
	3	1 + 3	1 + 2 + 3	%	
	No.	No.	No.	%	
BCG	0	0	130	100	130
DPT1	0	0	109	83	131
DPT2	108	100	98	75	131
DPT3	98	96	96	74	130
HBV1	0	0	108	82	131
HBV2	107	96	95	73	130
HBV3	92	89	57	45	126
OPV1	0	0	114	82	139
OPV2	113	106	106	77	138
OPV3	104	100	100	74	136
Measles1	0	0	99	74	134

Criteria: 1 = satisfies requirement for minimum interval between doses; 2 = satisfies requirement of minimum age; 3 = satisfies requirement for valid previous dose.

**Table 3 Vaccination status of children by card and by history, Al Mukalla, Yemen, 2004–05**

Status	By card	By history	Total	
			No.	%
Fully vaccinated	120 <sup>a</sup>	53	173	82.4
Partially vaccinated	20	6	26	12.4
Not vaccinated	0	11	11	5.2
Total	140	70	210	100

<sup>a</sup>5 of 120 got the newly-introduced pentavalent vaccine.

(47%) [9]. In the final YDMCHS report (1992), vaccination cards were seen by interviewers for only 40.3% of children aged 12–17 months, and for only 28.0% of those aged 18–23 months, which is lower than in this study [10]. Vaccination coverage for children in the district for different vaccines ranged from 86.7% (HBV3) to 94.3% (OPV1) for all children in the sample, and from 90.0% to 99.3% with the same antigens for children who had vaccination cards. This coverage was lower than that in studies in Ethiopia [11] and in Saudi Arabia [12] for all antigens except for the measles vaccine: 75% for the Ethiopian study and 86% for the Saudi Arabian study. However it was higher than the coverage found in YDMCHS 1992 and 1997 [8,10], and in the UNICEF survey [9].

In this study, 82.4% of children were fully vaccinated. This is higher than the goal set recently by GIVS for coverage at district level. It was higher than in the Ethiopian study (75.5%) [11], the Iraqi study (60%) [13], YDMCHS 1992 [10] (45%) and 1997 [8] (28%), and the UNICEF survey (28%) [9], but lower than in a 1991 Saudi Arabian study (91.9%) [12].

The proportion of non-vaccinated children in this study was 5.2% compared with 37%, 12%, and 8% according to the YDMCHS 1997, YDMCHS 1992, and the Saudi Arabian study respectively [8,10,12]. These differences are due to the improvement of the Yemeni EPI services in recent years. Another reason for this difference is the area covered by our survey (urban) versus

the areas (urban and rural) covered by the national YDMCHS survey, which found that urban children were much more likely to be vaccinated than rural children (56% versus 20% in 1997, and 72% versus 39% in 1992) [8,10].

The coverage with valid doses of the multidose vaccines (OPV, DPT, and HBV) was in the range 82%–83% for the first dose. For the second dose it ranged from 73% to 77%, and for the valid third dose it was 74% for OPV3 and DPT3 but only 45% for HBV3. The reasons for invalid doses were giving the vaccine too early and/or shorter time interval between the subsequent doses than the recommended, and/or an invalid previous dose.

The reasons for not vaccinating the child or not completing the course of vaccination were mostly due to lack of information. This is similar to the results of an Iraqi study [13]. For children in the YDMCHS 1992, obstacles (mainly “place of vaccination is too far”) were the main reasons children did not complete vaccination or were not vaccinated, however the results of the same survey showed that, for urban children, the reason cited most often by parents/caretakers was the lack of information [10].

**Table 4 Cause of non-vaccination, and partial vaccination, Al Mukalla, Yemen, 2004–05**

Cause	No vaccination (n = 11)		Partial vaccination (n = 26)		Total (n = 37)	
	No.	%	No.	%	No.	%
<b>Lack of information</b>						
Unaware of need	3	27.3	4	15.4	7	18.9
Place and/or time of vaccination unknown	1	9.1	5	19.2	6	16.2
Other	1 <sup>a</sup>	9.1	6	23.1	7	18.9
Total	5	45.5	15	57.7	20	54.1
<b>Lack of motivation</b>						
Postpone until another time	0	0	4	15.4	4	10.8
<b>Obstacle</b>						
Place of vaccination too far	4	36.4	1	3.8	5	13.5
Vaccine not available	0	0	4	15.4	4	10.8
Other	2 <sup>b</sup>	18.2	2 <sup>c</sup>	7.7	4	10.8
Total	6	54.5	7	26.9	13	35.1

<sup>a</sup>Fear of side effect.

<sup>b</sup>Mother too busy

<sup>c</sup>Child ill.

There was a delay in receiving the BCG vaccine (median age 11.8 weeks), this was due to interrupted supply of this vaccine. This was confirmed by the EPI programme report for the same period [5].

Only 8 children received pentavalent vaccine as it was introduced to the vaccination schedule in April 2005.

The high coverage of OPV and measles compared to the national figures was due to the effect of vaccination campaigns for these implemented during the years previous to this cluster survey.

Our results should be interpreted with caution due to the following study

limitations. The sample frame used to select clusters was administrative divisions (detailed census data could not be obtained for the district), the determination of the child's age when there was no card depended on the caretaker's recall, and the assumption of correct recording in the vaccination card by vaccinators may not be true for all children.

The coverage as estimated by this survey showed a high access rate to vaccination services in most cluster areas; however the greatest number of unvaccinated children was from areas relatively far from the vaccination centres (at the periphery of the district).

In conclusion, the survey shows high coverage of children with routine vaccination, low drop-out rate, and some receiving invalid doses.

The results of the survey demonstrate the need to improve the quality of the vaccination programme, this improvement can be achieved through acceleration of the health education programme to guarantee that all families know all the necessary facts about immunization, ensuring continuous supply of vaccines, and starting outreach vaccination sessions to cover areas far from the vaccination centres.

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