SURVEY OF IMMUNIZATION LEVELS AND FACTORS AFFECTING PROGRAM PARTICIPATION IN KEFFA, SOUTH-WESTERN ETHIOPIA

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ABSTRACT: To date there has been no systematic study on factors affecting participation in EPI in Keffa (Presently Illubabor) region. Using the EPI methodology and a structured questionnaire, a survey of 212 children below 2 years and their respondents was carried out to determine the levels of immunization coverage and identify factors associated with program participation during the period December 1987 to April 1988. it was found that in EPI service sites, 65.6% of study children were fully immunized, 29.2% partially immunized and 5.2% not immunized at all. For index mothers, the coverage for the second dose of TT was 31.1%. Extrapolation of the findings to eligibles of the entire region suggested only about 8% of children and 7% of pregnant women were protected. Of the variables selected for examination, factors related to health workers, health institutions, and those concerning consumers have shown significant effects. It is suggested that realistic social-mobilization, the application of modern principles of management techniques, practical public education and regular monitoring and evaluation will improve immunization coverage.

INTRODUCTION

Immunization is one of the most cost effective of all preventive health services (1). Although considerable progress has been made in delivering vaccines to the world's children, the potential promise of immunization remains unfulfilled (2). In terms of coverage, less than 40% of the target population has been immunized in most developing countries (3). For the case of Ethiopia the coverage rate remains below 20% (4) and the rate for certain antigens is minimal and drop-outs are varied. As the year 1990 has arrived, "Universal Childhood Immunization" in Ethiopia and in some other less developed countries is not likely to occur using current approaches (4,5).

A number of studies on demographic, behavioral and institutional aspects of child immunization have been carried out in many parts of the world (6,7). Several reasons for participation or non-participation in immunization program have been identified. The major ones were that people must be convinced of a reasonable likelihood that a disease will occur in their area and that they or their children are susceptible to it; they must be convinced that a disease is serious; and must be convinced at least of the safety if not the efficacy of a vaccine before accepting it. In addition, immunization status of children was related to the mohter's educational level, ethnic background, marital status, employment, distance to health facilities, the conditions of health workers, etc. The role of community acceptance and cooperation were demonstrated to have considerable effect on the initiation and completion of immunization programs in Gondar, Ethiopia (8).

This paper attempts to present the findings for some factors influencing childhood immunization in south-western Ethiopia. The complete study has been presented elsewhere (9).

MATERIALS AND METHODS

The study was carried out in Keffa (presently Illubabor), which is located in the south-western part of Ethiopia, between January and March of 1988. the study population was comprised of all children 12 to 24 months of age on the first day of the survey and parents or guardians. To ensure that the child had access

to immunization, only children who had been in Keffa for at least 6 months on the date of the survey were included in the study group. The study design utilized the modified Expanded Program on Immunization (EPI) methodology of the World Health Organization (10) and a questionnaire developed by this investigator. Using the EPI cluster sampling technique (11) the study group was selected to assess immunization coverage. A standardized and pretested questionnaire consisting of background (sex, age, relation to index child, length of stay in the locality, level of education, marital status, number of persons in the household, number of pregnancies, place of delivery of child, etc.) enabling factors (occupation, place of immunization, type of facility, etc.) and predisposing factors (knowledge of vaccine preventable diseases, source of immunization information, knowledge of the benefits and side-effects, age for immunization, etc.) were administered to mothers or nearest guardians of the child by trained interviewers. Interviewers used a manual that had been prepared by the investigator to help them understand the questionnaire and to use it properly. The questionnaire was written in English and Amharic.

The total number of children sampled was 212. The process of selection was achieved in two steps. The first was the random selection of communities in the region where the 30 clusters were located. This was accomplished by using the updated list of population figures with EPI centers from the regional health department. From a randomized starting point, 30 clusters were systematically assigned. The second step was the selection of representative households to discover children 12 to 24 months old where by the first household was randomly selected but the next ones were with the front doors nearest to the first household (11). The interview schedule was administered to mothers (guardians) of all the study group. To compare mothers (guardians) of immunized and non-immunized children, an attempt was made to arrive at optimum sample sizes by using certain assumptions (based on experience) for major variables. Therefore, the conclusion was that the working sample size of approximately 210 guardians should be large enough for the comparisons that were intended; the differences could be compared statistically with sufficient power to detect differences (12,13).

Data were collected for 212 respondents for immunized and non-immunized children on the study variables and transported to New Orleans, LA, U.S.A. by this investigator for analysis. Immunization status was taken as a binomial outcome (immunized or not) to facilitate data analysis using categorical method (12). The Biomedical Computer Program (BMDP) (14) was used for analysis.

RESULTS

A total of 1675 households were visited during the survey. An average of 55.8 households were identified to permit enrollment of at least 7 children per cluster. The number of households visited per cluster ranged from 13 to 125. A total of 212 children and 212 respondents (mothers, fathers or guardians) participated in the study.

The immunization status of study children and index mothers determined during the survey is summarized in table 1. Among the study children in the service zones, 65.6% were fully immunized (3 doses of polio, and DPT, 1 dose of BCG and measles), 29.2% were partially immunized and 5.2% were non-immunized (15). Of the index mothers only 31.1% had 2 doses of tetanus toxoid. Of the children, 9.4% were immunized prematurely and/or out of the recommended schedule (interval) for measles, polio and DPT.

Table 1 Summary of immunization status for - 30 clusters in Keffa Administrative Region, Ethiopia - March 1988.

Cluster	No.of, children	Vaccination card		DPT			Polio			Measles	BCG			Immunization status			Maternal TT		No.of houses visited
		+	-	1	2	3	1	2	3		Vacc.	Scar +	Scar -	Fully	Partly	Non	1	2	
1	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	2	2	44
2	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	3	3	82
3	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	2	2	62
4	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	5	5	60
5	7	6	1	6	6	6	6	6	6	5	6	5	1	5	1	1	4	4	81
6	7	7	0	6	7	7	6	7	7	6	7	7	0	5	2	0	6	6	13
7	7	6	1	1	6	6	6	6	6	6	6	5	1	5	1	1	1	1	56
8	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	6	5	60
9	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	2	1	71
10	7	6	1	6	6	6	6	6	6	5	6	6	0	5	1	1	2	2	51
11	7	7	0	7	5	4	7	5	4	5	7	5	2	2	5	0	1	1	49
12	7	7	0	7	7	7	7	7	7	6	7	5	2	5	2	0	0	0	49
13	7	7	0	7	5	4	7	5	4	6	7	6	1	2	5	0	0	0	43
14	7	4	3	5	5	5	5	5	5	4	5	5	0	4	1	2	1	1	77
15	8	6	2	7	7	6	7	7	6	6	7	7	0	5	2	1	2	2	53
16	7	7	0	7	6	4	7	6	4	6	7	6	1	2	5	0	0	0	60
17	7	5	2	7	7	7	7	7	7	6	7	7	0	6	1	0	3	3	59
18	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	3	3	50
19	7	4	3	5	2	1	5	2	1	2	4	4	0	0	5	2	0	0	77
20	7	7	0	7	7	7	7	7	7	7	7	6	1	6	1	0	2	1	29
21	7	4	3	4	3	1	4	2	1	2	4	3	1	1	4	2	0	0	50
22	7	7	0	7	7	5	7	7	5	7	7	7	0	5	2	0	3	3	29
23	7	7	0	7	7	6	7	7	6	5	8	7	0	5	2	0	1	1	43
24	8	8	0	7	8	6	7	8	6	6	7	7	1	3	5	0	4	4	31
25	7	7	0	7	7	6	7	6	7	7	7	7	0	6	1	0	3	2	125
26	7	5	2	7	7	7	7	7	7	6	7	6	1	5	2	0	4	4	25
27	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	2	2	112
28	7	6	1	6	6	6	6	6	6	1	6	4	2	0	6	0	0	0	41
29	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	5	5	43
30	7	7	0	7	7	7	7	7	7	6	7	4	3	3	4	0	3	3	40
Total	212	193	19	198	191	180	198	189	181	169	199	182	17	139	62	11	70	66	1675
%	100	19.0	9.0	93.4	90.1	84.9	93.4	89.2	85.4	79.7	93.9	85.5	8.0	65.6	29.2	5.2	33.0	31.1	

A breakdown of reasons for not immunizing the child are presented in table 2. There were a total of 68 responses. Of the total responses, 25.0% gave reasons related to lack of information; 11.8% gave reasons related to lack of motivation and 63.2% reported obstacles related to immunization.

Table 2. Stated Reasons by Respondents for Non-immunization of Children. Keffa, Ethiopia, February 1986.

Reasons	Number	%
Lack of Information		
Unaware of needed for immunization	4	5.9
Unaware of need to return for 2nd & 3rd dose	6	8.8
Fear of side reactions	6	8.8
Wrong ideas about contra indications	1	1.5
Total	17	25.0
Lack of Motivation		
Postpone till another time	6	8.8
No faith in immunization	2	2.9
Total	8	11.7
Obstacles		
Time of immunization inconvenient	3	4.4
Vaccinator absent	2	2.9
Mother too busy	5	7.4
Family problem including illness of mother	10	14.7
Child ill - not brought	1	2.9
BCG abscess, wrong age, etc.	21	30.9
Total	43	63.2
Grand Total	68	100.0

The variables found to be significantly related ($p<0.05$) to child immunization status are presented in table 3. The variables in the table are selected for the purpose of illustration.

DISCUSSION

While only 5.2% of children in service zones received no immunization, 65.5% were fully immunized and 29.2% were partially immunized based on the immunizations schedule followed in Ethiopia (13). The service sites experienced 85% full protection for DPT, polio and TB; and about 80% for measles (Table 1). Extrapolation of these findings to the population at large is inappropriate, since there is no full population coverage, as service sites are limited. However, there were 213,165 eligible children for immunization in Keffa for the year 1986 (16). Out of the total children, it was estimated that 16,198 where fully immunized (17). It was thus indicated that only 8% of the eligible children were immunized in the whole region. The explanations for this phenomenon were low geographic distribution of health facilities, communication drawbacks, logistics, deficiencies in planning, etc.

The immunization coverage of pregnant women left much to be desired with 31.1% having 2 doses of Tetanus Toxoid (TT). This is a relatively low coverage, although most developing countries experience 20% on the average (18). TT is given to prevent neonatal tetanus (NT). NT is second to measles as a global killer, yet remains a disease largely invisible to the health services, because its control requires a focus on immunizing women of child-bearing age and on improving delivery practices (19). EPI in Ethiopia has focused thus far on pregnant women rather than on women of childbearing age. This approach made it difficult to raise the coverage level since pregnant women are a difficult target population to reach for immunization programs. Additionally most vaccine campaigns are targeted at children.

There were 133,228 expected pregnancies in Keffa for the year 1986 (17). According to the report of the regional health department, 13,701 of the pregnant women received one dose of TT and 8,644 got 2 doses. This showed that only 6.5% of the pregnant women were protected with TT in that year. The 31% level probably reflects a cumulative effect from several years of effort, as well as the fact that only areas with EPI services were sampled.

Overall coverage for most of the childhood vaccines was relatively high where the programs were smoothly working though measles vaccine was less (79.7%). Measles is among the most infectious of the communicable diseases, and in many communities, immunization levels above 90% seem to be * probability <0.05required before transmission ceases (18). Even where transmission has been successfully interrupted, an epidemic may quickly occur if a sufficient pool of susceptible accumulate, particularly in Keffa where the children's

Table 3. Parental Characteristics for Immunized and Non-Immunized Children, Keffa, South-western Ethiopia, 1986.

Variable	Immunized (n=139)		Non-Immunized (n=73)		Chi-square Test Result
	N	%	N	%	
Sex					
Male	12	8.6	16	21.9	$X^2 = 7.36$
Female	127	91.4	57	78.1	d.f. = 1
					*p=0.0066
Length of stay in locality					
Since birth	37	26.6	29	39.7	$X^2 = 8.277$
Less than 5 years	39	28.1	17	23.2	d.f = 2
5 years or more	63	45.3	27	37.0	*p=0.041
Place of vaccination					
Outreach	61	43.9	46	63.0	$X^2 = 9.471$
Clinic	45	32.4	16	21.9	d.f. = 3
Health center	21	15.1	10	13.7	*p=0.0236
Hospital	12	8.6	1	1.4	
Knowledge of benefit of immunization					
To cure	24	17.3	12	16.4	$X^2 = 13.008$
To prevent	108	77.7	47	64.4	d.f. = 2
Do not know	7	5.0	14	19.2	*p=0.0046
Knowledge of completing time of primary series					
< 2 months	6	4.3	2	2.7	$X^2 = 22.25$
2-4 months	11	7.9	11	15.1	d.f. = 6
4-6 months	10	7.2	3	4.1	*p=0.0045
6-8 months	5	3.6	1	1.4	
8-12 months	83	59.7	28	38.4	
> 12 months	8	5.8	5	6.8	
Do not know	16	11.5	23	31.5	
Waiting time during immunization					
< 1 hour	12	8.6	6	8.2	$X^2 = 27.557$
1 hour	65	46.8	27	37.0	d.f. = 3
1-2 hours	47	33.8	13	17.8	*p=0.0001
> 2 hours	15	10.8	27	37.0	
Provision of additionl services (during immunization)					
Yes	69	49.6	22	30.1	$X^2 = 10.741$
No	70	50.4	51	69.9	d.f. = 1
Maternal immunization status	63	45.0	115	21.0	$X^2 = 14.23$
					d.f. = 1
					p=0.0042

nutritional status is markedly low (20).

There have been some drop-outs in all series of antigens (Table 1). Though there was an increased drop-out rate between the second and third doses, the rates were relatively small for all vaccines. It should be possible to reach all children who started the first dose, for even late doses will build immunity. The problem lies in reaching the target population to begin immunization.

The reasons for failure to start or complete the course of immunization were elicited (Table 2). Of the responses, obstacles to immunization, lack of information and lack of motivation constituted 63.2%, 25.0% and 11.8% respectively. Obstacles such as competing maternal responsibilities, erratic scheduling of services, technical mistakes (wrong technique, wrong age) by personnel etc. constituted the majority of reasons for failure. Lack of information included lack of awareness of need of immunization and the need to return for subsequent doses and fear of side reactions. This was mainly due to lack of communication between mothers and health staff, which discourage both initial utilization and return visits.

Respondent variables or characteristics in table 3 depict that when the nearest guardian of a child was a male, the proportion of immunized children was lower, 42.9%, as compared to 69.0"% for female. This is indicative of the fact that the women in general are considered better providers of health care for the family (21). Reaching women with proper health information will enhance better health care for children as well as the family (21). A lower proportion of children of native born i.e. 56% were immunized compared to 70% of the new comers. It was interesting to note that the shorter the period of time the parent had been living in the target area, the higher was the completed immunization rate. It was speculated that new comers were a better informed lot or more outreach may have been offered to them. The majority of children, 50.5% lived in sites served by outreach services but the immunization coverage was lower than that of fixed facilities. This may have been because outreach sites were mostly rural, relatively inaccessible and less supervisory support is offered to them. The distribution of responses as to the knowledge of benefit of immunization indicated some differences. Over all, 78% of respondents for immunized children mentioned to prevent diseases while 64% for the non-immunized group did not have any knowledge of benefit. Considering the expected completion time for primary series, a higher proportion (60% versus 38%) of the immunized group mentioned 8-12 months. Having no idea of the time was most common in the non-immunized group. When waiting time was reported to be greater than 2 hours only 11% were immunized, compared to 37% for the non-immunized. Waiting time is a known deterrent of initiation or completion of health services (22). The provision of other services during immunization was significantly associated with child immunization. This emphasizes the fact that integration of services is beneficial and motivating. It reduces frequency of trips to health facilities and ensures continuance of services. It was observed that child immunization status was significantly related to that of the mother. It has been reported that maternal utilization of health services was determined to be a key predicator of whether a child enters the medical care system (19,21). The role of mothers in the care of their children can not be over emphasized. Mothers with active interventionist orientation toward health care or who attributed high susceptibility to their children are high users of preventive care.

CONCLUSION AND RECOMMENDATIONS

In Keffa and/or Ethiopia, universal childhood immunization will not likely occur by 1990 or in the very near future using the current approaches. Concerted efforts need to be taken at all levels of the health care, viz:-

1. Bottom-up Approach through Realistic social-mobilization.

- Immunization programs are more sensitive to self-reveal the success or failure of preventive services than others. In fact they can indicate the weakness and strength of the general health care system. The programs once started should be maintained. For this, empowering the communities to play a more active role in planning, implementing and monitoring avenues for this endeavour may be the attainment of realistic political support, collaboration with other sectors, linking immunization to social and/or ceremonial activities within communities, etc. This will eventually enhance the "Bottom-up Approach" which is evidently necessary for the overall community development.

2. Improve the management of the health services.

- Management is a large concept and embraces many functions. For the purpose of this recommendation some aspects in the planning, supervision, management of resources and programs will be touched.

2.1 Target setting

- It is common to see health personnel at the regional or district levels that do not present the size of the target population they are attempting to serve. They are thus unable to think in terms of coverage implications when reviewing information such as number of children immunized, new pre-natal visits, health center or hospital deliveries, etc. In this case there is often a limitation in the ability to relate health resources to populations, or to understand the distribution of special risk groups in the catchment area.

2.2 Information on effectiveness and efficiency

- Insufficient attention is given to the effect of health service activities including immunization programs, e.g. there is no reliable incidence or prevalence data on EPI target diseases at district, regional or national levels. One reason (apart from case detection capability) for this state of affairs is the lack of information about the denominator population which is necessary to understand program effects in epidemiological terms.

2.3 Resources (personnel, finance, vehicles) and utilization.

- The pressing problems in management seem to be inadequate performance of personnel (managers as well as subordinates) in the health service. The problems may be attributable to: 1) the individual capabilities of the staff and their motivation in the performance of their jobs, 2) the operating environment in which many personnel work and the support they receive in that environment, and 3) the external forces (e.g. policy and priority matters in the government, etc.).

These problems may be better handled if purposeful, planned and periodic supervision is carried out by all levels of the health care. Supervision seems to have been acknowledged essential in the health care system but is done poorly or not at all, especially in places where its inadequacy or absence is visibly felt; at the community or district level (23). The supervisory activity when done, should address the clarification of program objectives, analysis of difficulties encountered, development of staff motivation and some kind of continuing education. To aid supervision, instruments should be developed. In the design of instruments, selected areas from program objectives, job description of the particular health workers, performance standards, etc. may be utilized. Example, to supervise EPI related activities, one can consider the program objectives, incidence or prevalence of target diseases, number of target groups, operation of the cold chain, coverage, activity schedule, techniques of immunization, expected performance from the health worker, participation of the community, etc. The supervisory activity should be given feedback for the purpose of follow-up.

While supervision is a necessary tool for performance improvement, it is not in itself sufficient. Supervision should base itself on a clearly set program objectives, the job description of personnel, the specific tasks to be done and the acceptable standards of performance (24). This helps personnel to if she/he is performing correctly. Upon good performance, personnel should be rewarded in some feasible ways (e.g. letter of recognition, giving more training, increasing responsibility, etc.)

The financial management, though finance is scarce in the health system, is often separated (fragmented) from service provision responsibilities. Thus, there exist two separate reporting systems: one id for finance, and the other is for services offered. These reports are often directed upwards and not horizontal. It is very unlikely that managers or professionals know the cost incurred for various services offered for particular period of time. Neither do the financial section workers in the health services realize the costs and toiling rendered by health workers out in the field. The travel and daily allowances stringently allocated for field staff are below available food and lodging rates necessitating additional expenses from the staff making the workers avoid outreach activities or cut short the duration and frequency of supervisory visits. All of these affecting the expansion of health service programs, be it immunization or otherwise.

Vehicles in health facilities have many possible uses other than those for which they are intended, and by their very nature are often not under close scrutiny. It is in fact a critically important resource for ensuring adequate support for the health activities including immunization. Ensuring that vehicles are being used efficiently and effectively is therefore an important issue for the execution of programs.

It is more complex, but not impossible to relate vehicle use to specific purposes, such as supervision, immunization, prenatal services, environmental health etc.

In general, it is worth nothing here that success in management should be judged by not only how well managers and/or officials in the health services perform their own tasks but, also by how effective they are in organizing the work of others i.e. coordination and delegation of tasks with authority and workable resources. The delegation component seems to be markedly missing or weakly assembled in the health care.

2.4 Staff motivation

- Program objectives, however good they may be, do not generate good results of their own accord. These objectives meed to be perceived, accepted and understood by workers eager to achieve them (25). Health personnel should be given support wherever the need is felt, whether it be in the understanding of objectives, in the performance of tasks or in human relations (23,25). For instance, the essential elements of the cold chain system (the most important component of the vaccination program) are "PEOPLE" to organize and manage the vaccine and the program; and "The Equipment" to store and transport the vaccines (26). The importance of people in the system can not be stressed enough. Even if the finest and most modern equipment and transport are available, the cold-chain will not be effective if people do not handle and administer the

vaccines properly. It seems that much is said about the care of the cold-chain, vaccine handling, coverage, etc. but relatively little on the personnel doing the operation. The issue of "the human factor" needs to be carefully addressed inn program development and execution. Feasible and workable managerial techniques to motivate staff in our situations are encouragement of open communication through periodic meetings, recognition of individual abilities and giving assistance to realize their full potential, providing staff with appropriate resources and authority to carry out the tasks efficiently, adapting approaches to personnel matters according to the situation as well as to the individual, using discipline, praise, guidance, etc. as appropriate.

3. Campaign versus Sustenance

- It is observed through experience that a great deal of campaign methodology is applied to accelerate the EPI program. The importance of campaigns should not be undermined in their relation to national or global commitments. However, it is equally important that programs be technically and managerially sustainable and financially viable. Before campaign momentum subsides, system should be established or strengthened to carry on immunization activities for new cohorts of new borns and women who will be at risk. Factors that may be considered to improve sustainability in immunization endeavors are:

1) Financial

- Almost all of the capital investment for EPI in Ethiopia is made by donor agencies. The continuation of such investment is not assured. In fact donor support is subject to the priorities of the governments and organizations which provide resources. Therefore, the gaps in financing may be identified and hopefully resolved through additional government outlays, private contributions, service fees, etc.

2) The Primary Health Care Strategy (PHC)

- The primary health care infrastructure has been strengthened by the acceleration of immunization activities. Very often EPI has been considered to be a "locomotive" which may have been used to pull along other services. It is thus important to be cautious while introducing new interventions during the post-campaign period for this may affect the continuation or refinement of immunization activities.

3) Strengthen the fixed and outreach facilities by,

a) ensuring maintenance of equipment that is in place (cold chain, injection, sterilization, etc.)

b) facilitating community level surveillance for births and deaths and therefore, determination of vaccination target population.

c) setting quantified monthly targets for vaccination at the local level.

d) conducting regular supervision from higher levels.

4. The need for continued and effective health education.

- In order to increase the immunization coverage (or utilization of other health services), public education must be continuously given while monitoring its effectiveness in relation to the purpose.

Health education does not replace other health services but it is needed to promote their proper use. The concern here is promoting health behaviour because behaviour could be the main cause of a health problem as well as the main solution (27). The common misconception of equating health education to health information needs to be straightened. Health information (passing only information on health matters by word of mouth, printed materials, etc.) is a basic component of health education but the latter addresses a lot more issues, e.g. attempts to facilitate resources, adaptation of the given information, skills in the application of the information, etc. In addition, health education necessitates a shift from a paternalistic advocacy of behaviour change to the participant assumption of responsibility for his/her own care. Health workers should also realize that their own personal example serves to educate the public.

5. Research

- Research is needed to diagnose local health problems including immunization, analyze their causes, and design alternative approaches to problem-solving. The role of research in problem solving should be appreciated and supported.

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