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Dacca, Bangladesh
January 1981

Scientific Report No. 43

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PREFACE

The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) is an autonomous, international, philanthropic and non-profit centre for research, education and training as well as clinical service. The Centre is derived from the Cholera Research Laboratory (CRL). The activities of the institution are to undertake and promote study, research and dissemination of knowledge in diarrhoeal diseases and directly related subjects of nutrition and fertility with a view to develop improved methods of health care and for the prevention and control of diarrhoeal diseases and improvement of public health programmes with special relevance to developing countries. ICDDR,B issues two types of papers: scientific reports and working papers which demonstrate the type of research activity currently in progress at ICDDR,B. The views expressed in these papers are those of authors and do not necessarily represent views of International Centre for Diarrhoeal Disease Research, Bangladesh. They should not be quoted without the permission of the authors.

ABSTRACT

In a rural area of Bangladesh, tetanus vaccination to pregnant women was offered within the context of a maternal-child health and family planning programme. During a period of 16 months, only about 34 percent of pregnant women identified by field workers received full immunization (2 injections) and about 5 percent received partial immunization (1 injection). The major reported reasons for non-acceptance of vaccination were objection by husbands and mother-in-laws, fear of women due to lack of experience with injections during pregnancy, fear from village rumours, and failure of workers to inform pregnant women about vaccination early enough. The most frequently reported reason for failure to accept the second injection was the departure of the women from their usual residence in preference of confinement in their parents' house. The constraints in the community diagnosis of neonatal tetanus appeared to adversely effect perception of the cent-percent effectiveness of the vaccine.

The findings of this study did not support an apprehension that previous provision of injectable contraceptive had discouraged women from accepting tetanus vaccination. The families of tetanus vaccination acceptors appeared to adopt usage of home-based oral therapy for diarrhoea sooner than the families of tetanus vaccination non-acceptors, suggesting that in the community some households were likely to accept a variety of modern medical technologies earlier than others. However, a comparison of acceptors and non-acceptors of vaccination showed little differences between the two groups in terms of their socio-demographic characteristics.

INTRODUCTION

The provision of accessible, effective, and safe health services at affordable cost to large under-privileged populations of developing countries is one of the major challenges facing mankind. High morbidity and mortality rates, particularly among children, are known to be directly caused by viral and bacterial infections superimposed upon malnutrition, high fertility, and unsanitary environments. Scientific advances over the past several decades have resulted in some highly effective medical technologies against these direct causes of ill health. Where access and utilization of these technologies have been achieved through basic health delivery systems, conclusive evidence has been obtained documenting marked improvements in the levels and patterns of mortality (1-2).

The gap between technology potential and realization is therefore substantial and may constitute one of the most critical areas of health care needs in many developing countries. One example of this gap is high infant mortality due to neonatal tetanus. Despite the availability of a highly efficacious vaccine against the disease, tetanus neonatorum remains one of the leading causes of neonatal mortality in many developing countries (3-6). The delivery of tetanus vaccine basically confronts two non-mutually exclusive strategic choices. First is the vaccination of all women of reproductive age (or younger) by mass campaign (7). Mass vaccination, however, may disrupt rather than strengthen village-based basic health service infrastructure, organization, and development. Also, since the duration of vaccine protection is limited booster immunizations would be required, thereby necessitating repeat campaigns at regular intervals or the institution of another immunization back-up system. A second strategy is to vaccinate women during pregnancy within the context of a maternal-child health programme. Active immunization of pregnant women has been demonstrated to be highly efficacious (8), although its implementation depends upon the development of an efficient and permanent field infrastructure to identify and reach every eligible women with information and vaccine. Even with full availability of services, however, there is no guarantee that the programme will have significant impact on neonatal mortality unless a significant proportion of women accept the service. The acceptability of services is a multi-faceted behavioral concept, incorporating such factors as community attitudes toward a disease, its prevention, and the health service system; willingness of those at risk to accept vaccination; perceived effectiveness of vaccination by the target population; and possible interactions between tetanus vaccination with other health services.

In October 1977, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), formerly Cholera Research Laboratory (CRL) initiated an integrated maternal-child health and family planning programme in half of its Matlab field surveillance area. Active immunization of all pregnant mothers against tetanus neonatorum was an important component of this programme. Because the ICDDR,B maintained careful service records, operated an

independent demographic/epidemiologic surveillance system in the same population, and could conduct field surveys to obtain in-depth information on specific knowledge gaps, a unique opportunity presented itself to examine some of the operational issues related to the delivery of tetanus immunization services to pregnant women within the context of an integrated MCH-FP programme. More specifically, the Matlab experience provided an opportunity to examine factors related to: (1) coverage of the programme; (2) vaccine non-acceptance; (3) changes of vaccine acceptance over time; and (4) interactions between tetanus vaccination and other health interventions provided by the programme.

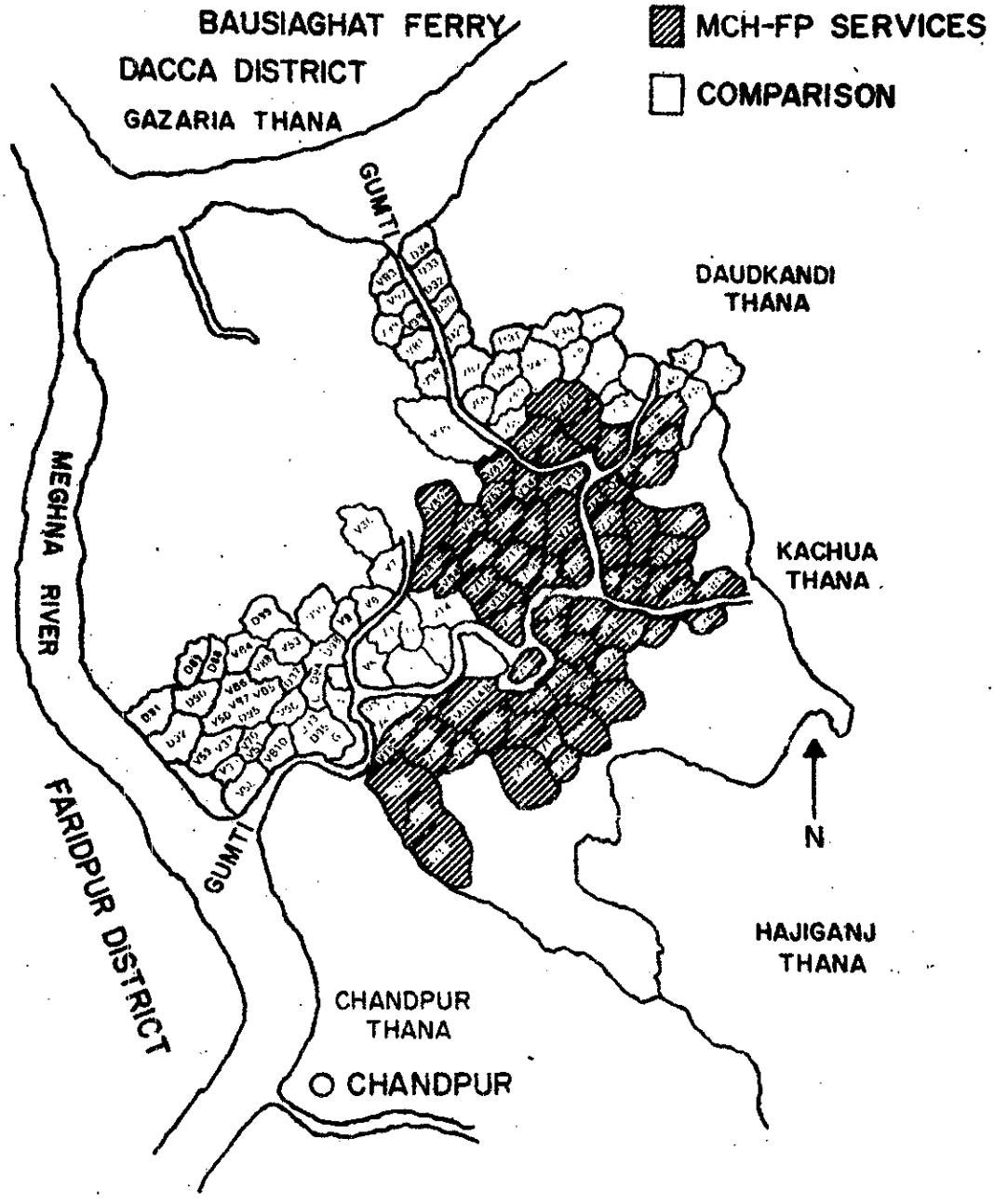
MATERIALS AND METHODS

The maternal tetanus immunization programme reported in this paper was conducted in Matlab thana, Comilla district, Bangladesh. The ICDDR,B has conducted epidemiological research in this area since 1963, including the conduct of five large scale cholera vaccine field trials. A longitudinal vital registration programme has been in operation since 1966 and, since 1978, has covered 177,000 persons residing in 149 villages. Field methodologies of the demographic surveillance and diarrhoeal health services have been reported in several previous publications (9-10).

In October 1977, the ICDDR,B restructured a non-clinical village-based family planning programme (11) into an integrated village-based maternal-child health and family planning (MCH-FP) programme in 70 villages (about 90,000 population) of the Matlab field surveillance area (12). The remaining 79 villages of the study area with about 86,000 population served as a comparison population. To implement this new programme, a cadre of 80 female village workers (FVWs) were recruited and trained. These new workers with a minimum of seventh grade education were trained to deliver MCH-FP services, each for a population of 1,100 persons or 220 families in the neighbourhood of her residence. The FVWs visited each family fortnightly covering about 22 families per day. The work of these 80 FVWs was supported and supervised by 4 senior field assistants (SFAs) and 4 lady health-family planning visitors (LHFPVs) residing and operating out of 4 subcentres dispersed in the area. The subcentres primarily served a support and training facilities. Figure 1 shows the Matlab study area divided according to the MCH-FP programme and the comparison areas.

Initially, the Matlab MCH-FP programme provided modern contraceptive and related family planning services exclusively. By June 1978, after the FVWs had become trained and familiarized with their work and the supervisory structure was operating smoothly, immunization of pregnant mothers with 2 doses of tetanus

FIGURE 1


BAUSIAGHAT FERRY
DACCA DISTRICT
GAZARIA THANA
MCH-FP SERVICES
COMPARISON
GUMTI
DAUDKANDI THANA
MEGHNA RIVER
KACHUA THANA
N
FARIDPUR DISTRICT
GUMTI
HAJIGANJ THANA
CHANDPUR THANA
O CHANDPUR

toxoid was introduced*. FVWs identified all eligible women during fortnightly visits and informed them and their families about the advantages of tetanus immunization during pregnancy. Those who agreed to accept the vaccine were given 2 doses of an aluminium-phosphate-adsorbed tetanus toxoid on a schedule of .5ml any time after the 5th month of pregnancy and another .5ml at a minimum of 4 weeks apart, preferably by the 8th month of pregnancy and at least 4 weeks before the due date of delivery.

The supply of vaccine was procured from the Bangladesh Government with the assistance of the World Health Organization (WHO) office in Dacca. WHO guidelines on "cold-chain" procedures for storage, transport, and delivery of the vaccine were followed. Vaccine stock was stored in a refrigerator in Dacca and shipped monthly to the Matlab field station in specially-designed cold thermos. At the field station, the vaccine was stored in a refigerator; the electric power was often maintained by a generator during power failures. Vaccines were consistently stored and transported at 4-8°C, and were discarded if the temperature exceeded 8°C for a cumulative period of 72 hours. In fortnightly meetings at the subcentres, the FVWs submitted lists of pregnent women willing to accept the vaccine. Accordingly, vaccines were despatched from Matlab centre to the subcentres for distribution among the FVWs. Since the subcentres had no electricity, cold boxes with refreshed freezer packs were rotated to the subcentres every two days. Moving from the subcentres, the FVWs carried the vaccine to the homes of pregnant women and delivered the vaccine using 1cc disposable needles and syringes. All unused vaccines left over at the end of a day were discarded.

Field records of eligible women and vaccinees were maintained by the FVWs. Each FVW maintained a field register which contained an up-to date list of all currently married women (age 15-44 years), supplemented with information on their current reproductive status, use of contraception, expected date of termination of pregnancy, schedule of tetanus vaccination, and dates and number of immunizations given. The information was continuously up-dated by the FVW during her routine fortnightly home visits. For the purpose of the present analysis, a list of all women of the MCH-FP programme villages who delivered a live birth or still birth during the period September 1, 1978 through December 31, 1979 was prepared on the basis of the FVWs field register. Another independent list of the mothers having still and live birth terminations during this period was generated by computer from the Matlab vital registration records. The demographic surveillance system operated independently of the FVWs registery. Therefore, matching of the two lists yielded information on the extent of programme coverage and completeness of identification of eligible women by the FVWs.

To obtain indepth information on acceptance patterns, a samply survey was conducted in October-November, 1979 among 250 randomly selected full-acceptors (women who received 2 injections), 79 partial acceptors (women who

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* Initially, three doses were offered, but the 2 doses schedule was introduced and maintained beginning in July 1979.

received one injection), and 250 non-acceptors. The sampling procedure involved a systematic sample of 30% of the MCH-FP villages. From the FVWs field registers in these villages, a list of all women who delivered a live birth or still brith between the period September 1, 1978 and August 30, 1979 was obtained. These lists generated 250 full-acceptors of the tetanus vaccine during pregnancy. These 250 full-acceptors and another 250 non-acceptors from the same villages were selected for indepth interviews. Because of their limited number, all of the 79 partial acceptors of the entire programme area were included in the survey.

The interview consisting of a questionnaire was administered by trained female interviewers of ICDDR,B. The questionnaire was developed through discussion with investigators and field supervisors and was pre-tested among 15 mothers in non-selected villages. The questionnaire aimed at soliciting information on selected socio-demographic characteristics of the respondents, their past experience of neonatal tetanus deaths, reasons for acceptance or non-acceptance of the vaccine, and their intention of future vaccine acceptance. The survey completed successful interviews on 210 full-acceptors, 72 partial acceptors, and 241 non-acceptors. The reason for unsuccessful interviews was non-availability of the respondents at home. There were no refusals.

In order to compare these interview responses of the reasons for partial acceptors and non-acceptors against the perceptions of the FVWs, the FVWs of the relevant villages were also interviewed. The interview was conducted by the supervisory staff in a fortnightly meeting at the respective subcentres. The FVWs identified each partial-acceptor or non-acceptor and provided reasons case-by-case for non-acceptance as recorded in her field diary or, in some cases, from recall.

Beginning in January 1979, seven months after the initiation of the tetanus immunization programme, a field trial of home-based oral therapy for diarrhoea was mounted within the context of the MCH-FP programme. The FVWs trained about 1,400 village women (*bari* mothers) to prepare, distribute, and manage the use of oral fluid for treatment of diarrhoea within a *bari*, a cluster of patrilineally related households. The details of this oral therapy programme are presented elsewher (13). In order to examine possible interactions between the tetanus immunization and the oral therapy health services, 30% of the 1978 tetanus immunization acceptors were selected through a systematic random sampling procedure. An equal number of non-acceptors matched by number of living children and by village of residence were also selected. To determine oral therapy acceptance and use in relation to previous acceptance of tetanus immunization, acceptance of oral therapy and number of packets consumed by the families of the sampled acceptors and non-acceptors were noted from field records over the first 6 months of 1979.

RESULTS

Service Coverage:

In the Matlab MCH-FP area, there were 4,393 women who delivered a live birth or still birth during the 16 month period, September 1978 through December 1979. Table 1 shows these birth events by four 4-month periods. The rate of identification of these eligible women by the FVWs and the rate of acceptance are also shown. As the data indicate, the FVWs identified only 54.3% of the eligible women in the first 4-month period. The identification rate increased stadily as the programme matured, reaching 81.8%, 87.8%, and 88.6% for the second, third and fourth 4-month periods, respectively. For the entire 16 month period, 77.8% of eligible women were identified by the FVWs.

Identification rates appeared to improve village-wise as the programme matured. Figure 2 shows changes of the FVW identification rate by village over time. Presumably, inter-village variation in identification rate may be due to differential performance of FVWs in monitoring pregnancies and maintaining accurate field registry books. In the first period, only 16 of 70 villages had identification rates of 90% or more, and in the 28 villages, FVWs identified less than 50% of the eligible women. By the fourth period, 38 villages had achieved 90% or more coverage and no villages had rates below 50%. The observation that 28 villages during the fourth 4-month period still had identification rates of 70-89% suggest that, while coverage may attain high levels, 100% identification of all eligible women would be very difficult to attain, for reasons described later.

Vaccine Acceptance:

Table 1 also presents the vaccine acceptance rate by 4-month periods. Full acceptance (2 doses) was achieved for 43.1% of the identified women in the first period. The corresponding rates for the second, third, and fourth periods were 30.7%, 34.8%, and 31.5%, respectively. Partial immunization (1 dose) was uniformly very low throughout, and non-acceptance approximated two-thirds of the eligible women in all four periods. The higher acceptance rate in the first 4-month period is artifactual since acceptance rate as defined here applies only to identified women. Had all eligible women been considered, the acceptance rates would have been uniformly lower in all periods, with the lowest in the first 4-month period.

Table 2 attempts to examine whether acceptance could be associated with selected socio-demographic characteristics of the eligible women. A comparison of acceptors (full and partial) versus non-acceptors according to age, religion, education, number of children, and occupation of the household head showed little differences between the two groups. Acceptors had a higher proportion of Hindus, higher levels of education, and more often had household heads in service or business occupations than non-acceptors, but the differences are small and statistically non-significant.

Fig : 2

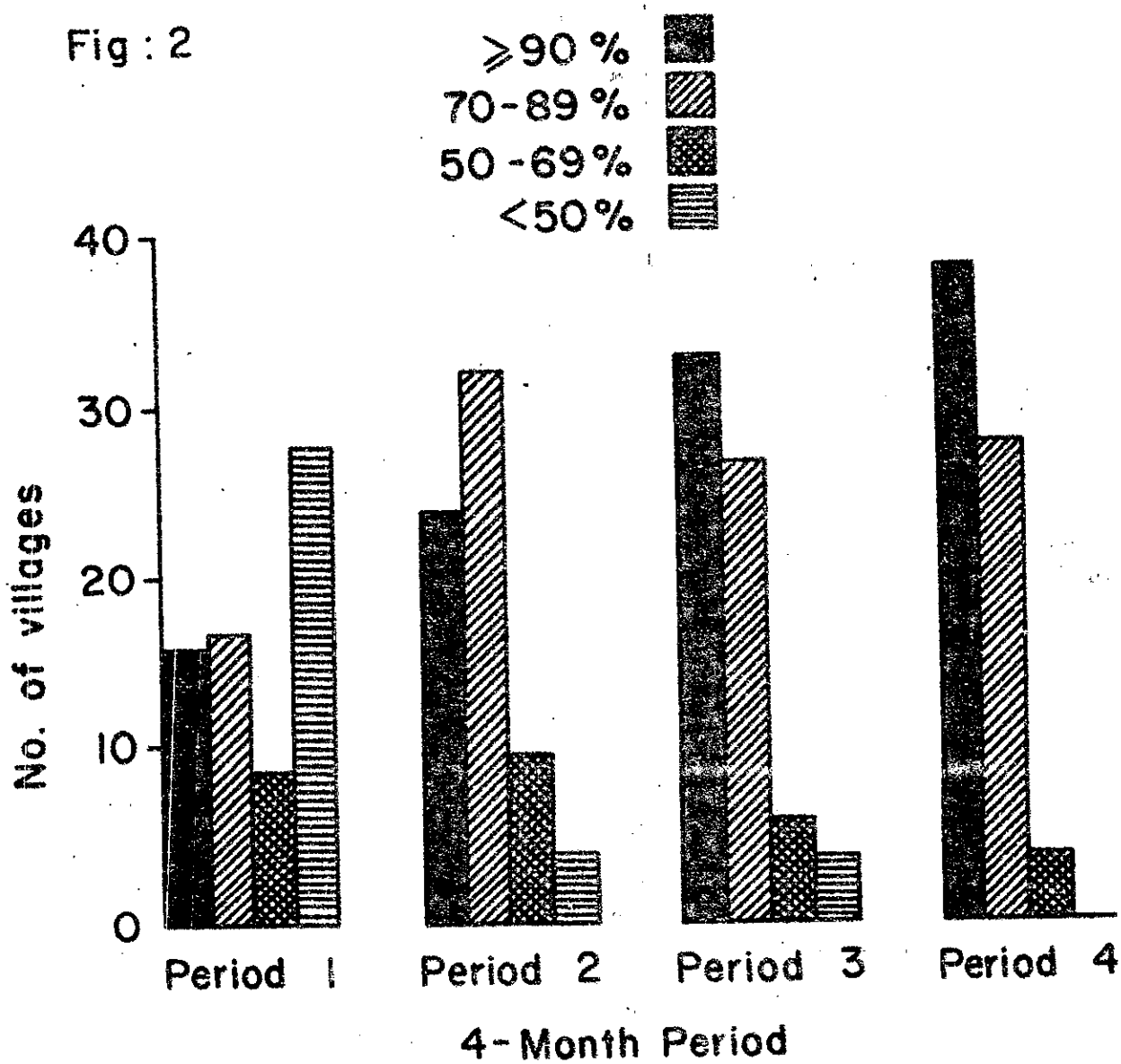

≥90 %
70-89 %
50-69 %
<50 %
40
30
20
10
0
No. of villages
Period 1
Period 2
Period 3
Period 4
4-Month Period

TABLE 1

RATE OF IDENTIFICATION* OF ELIGIBLE WOMEN BY FEMALE VILLAGE WORKERS AND RATE OF ACCEPTANCE* OF TETANUS IMMUNIZATION DURING FOUR 4-MONTH PERIOD (SEPTEMBER 1978-DECEMBER 1979) IN MATLAB, BANGLADESH

	4-Month period				
	Period 1	Period 2	Period 3	Period 4	All
No. of mothers registering still birth or life birth event	1185	928	831	1449	4393
No. of eligible mothers identified by FVWs	643	759	730	1284	3416
Percent identification rate	54.3	81.8	87.8	88.6	77.8
Percentage distribution of identified women:					
Full acceptors	43.1	30.7	34.8	31.5	34.2
Partial acceptors	5.7	2.8	2.9	6.5	4.8
Non-acceptors	51.2	66.5	62.3	62.0	61.0

* The identification rate is computed by dividing the number of eligible mothers identified successfully by the FVW by the number of eligible women independently estimated from the vital registration system. The acceptance rate is computed by dividing the number of acceptors by the number of eligible women identified.

Note : Full acceptance means acceptance of 2 injections and partial acceptance means acceptance of 1 injection.

TABLE 2

SELECTED CHARACTERISTICS OF FULL AND PARTIAL ACCEPTORS AND NON-ACCEPTORS OF TETANUS IMMUNIZATION DURING PREGNANCY IN MATLAB, SAMPLE SURVEY (SEPTEMBER 1978 - AUGUST 1979)

Characteristics	Full and Partial Acceptors (n=282)	Non-Acceptors (n=241)
Age (Years):		
Mean	26.7	26.1
Median	26.7	25.7
Religion (%):		
Hindu	17.4	14.1
Muslim	82.6	85.9
Education of Women (%):		
5th grade and above	14.5	10.4
1-4 years	22.3	24.1
No schooling	63.2	65.5
Children (Mean Number):		
Currently living	2.9	3.0
Total births	3.9	3.8
Occupation of Household Head (%):		
Agriculture	38.3	43.6
Service	9.2	7.9
Business	16.7	14.5
Other	35.8	34.0

TABLE 4

DISTRIBUTION OF PARTIAL ACCEPTORS OF TETANUS IMMUNIZATION DURING PREGNANCY BY REASONS FOR NON-ACCEPTANCE OF THE SECOND IMMUNIZATION IN MATLAB, SAMPLE SURVEY (SEPTEMBER 1978 - AUGUST 1979)

Reasons for Non-Acceptance	Number	%
Program-related:	12	16.6
Birth before due date of second immunization	9	12.4
Workers failed to bring vaccine	3	4.2
Client-related:	50	69.4
Mothers shifted to parents' residence	23	31.8
Objections of husbands/mothers-in-laws	11	15.3
Mothers' fear, heard rumour	9	12.5
Mothers' illness	4	5.6
Mother's disliking	3	4.2
Others:	10	14.0
Pregnancy resulted in miscarriage	4	5.6
Others reasons	3	4.2
Don't know or no response	3	4.2
All reasons:	72	100.0

TABLE 5

NEONATAL MORTALITY RATE (PER 1,000 LIVE BIRTHS) AMONG LIVE BIRTH COHORT (SEPTEMBER 1, 1978-AUGUST 31, 1979) ACCORDING TO TETANUS IMMUNIZATION IN WOMEN DURING PREGNANCY AND ATTRIBUTED CAUSE OF DEATH IN MATLAB STUDY AREA

Attributed Causes of Neonatal Death	Neonatal Mortality				Percent Reduction
	Immunized		Non-Immunized		
	No.	Rate	No.	Rate	
Alga	20	26.2	118	56.2	53.4
Dhanustonkar	3	3.9	19	9.9	60.6
Takuria	1	1.3	6	2.9	55.2
Others	7	9.2	20	9.5	3.2
All	31	40.6	163	77.6	47.7

matched those claimed by the programme. This is done in Table 5, where the attributed causes of neonatal deaths are noted according to the mother's acceptance of tetanus immunization during the pregnancy. In comparison to the non-immunization group, mothers who were immunized experienced a 53.4% lower *alga* mortality rate, a 60.6% lower *dhanustonkar* mortality rate, and a 55.2% *lower* takuria mortality rate. The neonatal mortality rate due to all "other" causes was similar between the vaccine and non-vaccine groups. This implies that, while the vaccine reduced substantially neonatal tetanus deaths attributed to all three of the causes known to contain true tetanus, many mothers who accepted the vaccine nevertheless still experienced *alga*, *dhanustonkar*; or *takuria* neonatal deaths even after accepting the vaccine.

Another factor investigated was worker performance. If worker performance were a major factor in explaining the failure of acceptance to increase over time, one might expect a relationship between worker identification and worker-specific acceptance rate (e.g. better-workers in comparison to poorer workers achieve greater success with both). This is examined in Figure 3, where the identification and acceptance rates achieved by 80 FVW workers are plotted and related by linear regression. In the first 4-month period, workers with high identification rates also had high acceptance rates ($r=0.60$, $P<0.01$), but by the fourth 4-month period, the relationship became less marked and non-significant statistically. The correlation in the first period suggests that some workers were indeed superior than others in terms of identifying mothers and promoting acceptance. The reduction of this relationship in the fourth period, coinciding with increasingly superior programme coverage (Table 1), suggests that despite improved worker performance and increased coverage, acceptance rates remained constant, probably reflecting client reluctance for reasons as noted in Table 3 and 4.

Vaccine acceptance among non-pregnant women:

Given the disappointing vaccine acceptance rates during pregnancy and the lack of improvement over 16 months of programme operation, it was thought worthwhile to compare the 1978-79 acceptance rate with comparable rates obtained in 1974 when an attempt was made to vaccinate all non-pregnant women as part of a cholera toxoid field trial (7). In 1974, teams of vaccinators undertook a double-blind vaccine campaign randomly assigning all non-pregnant women to either a cholera vaccine group or to a control group (tetanus vaccine). Acceptance data in 1974 and 1978-79 are not strictly comparable, since the 1974 vaccinees were informed that the vaccinations were being offered as part of a field test of a new cholera vaccine.

Table 6 shows the rate of vaccine acceptance among non-pregnant women in 1974. Given the double blind nature of the 1974 trial, no differences are noted between the cholera and tetanus acceptance rates, as expected. No differences were noted also according to the age of the women. Among the tetanus vaccinees in 1974, 55.1% of all non-pregnant women accepted 2 injections

Fig : 3a

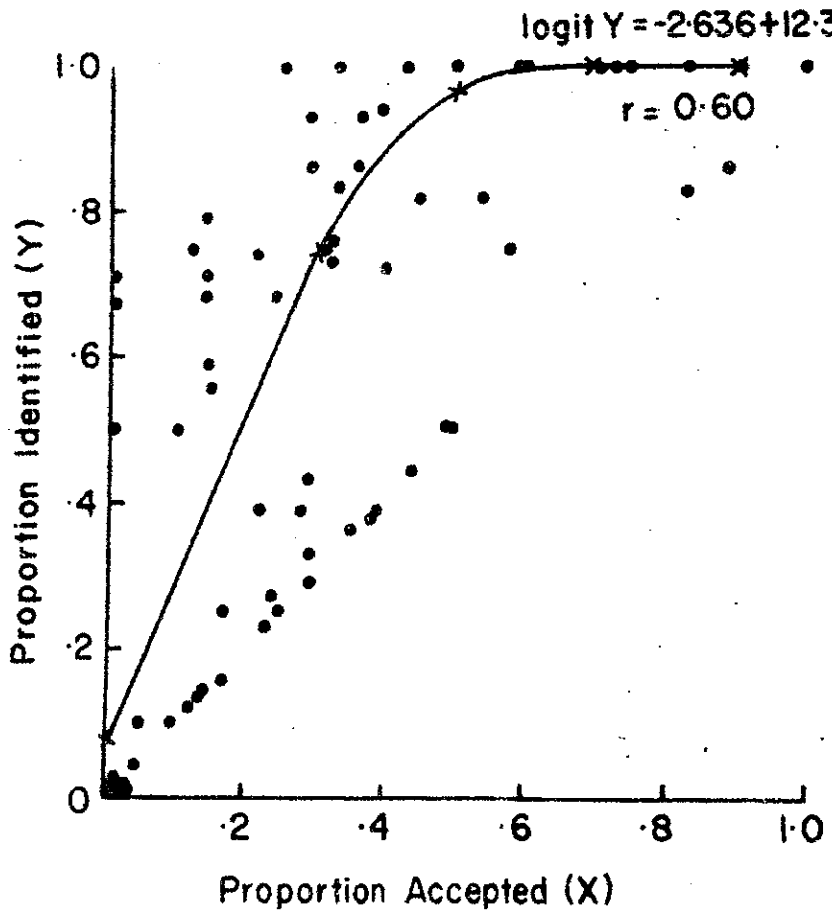

logit Y = -2·636+12·317 x
r = 0·60
Proportion Identified (Y)
1·0
·8
·6
·4
·2
0
·2
·4
·6
·8
1·0
Proportion Accepted (X)

Fig : 3b

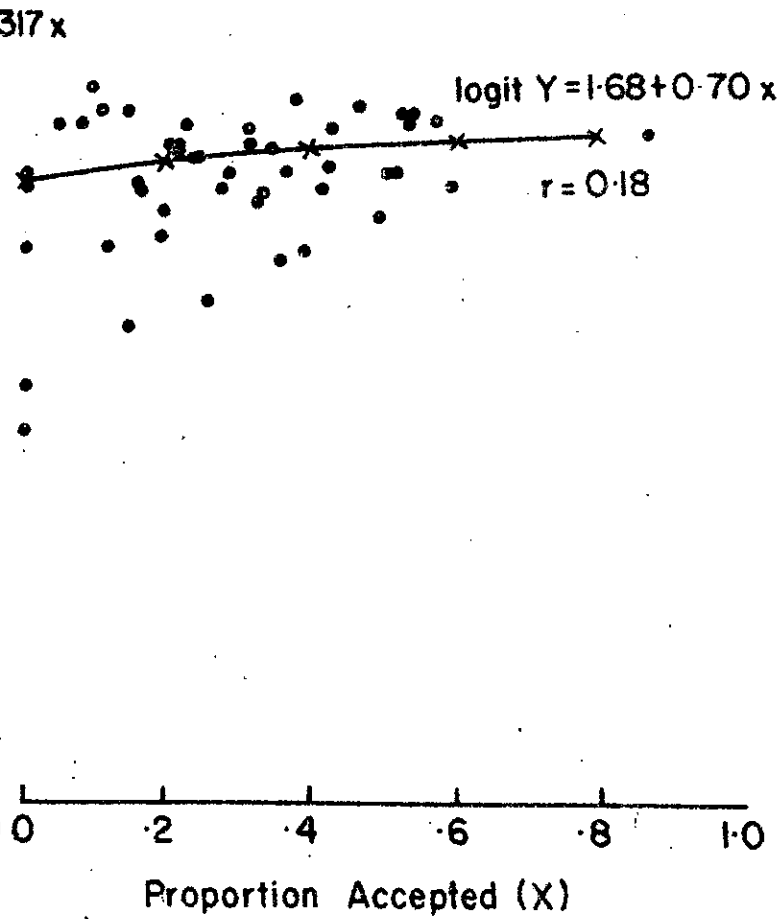

logit Y = 1·68+0·70 x
r = 0·18
0
·2
·4
·6
·8
1·0
Proportion Accepted (X)

TABLE 6

RATE OF FULL AND PARTIAL ACCEPTANCE OF TETANUS AND CHOLERA VACCINE BY NON-PREGNANT FEMALE ACCORDING TO AGE, MATLAB, 1974

Age (in years)	Tetanus Vaccine				Cholera Vaccine			
	All	Full	Partial	None	All	Full	Partial	None
<19	100.0 (1022)	56.0 (572)	15.8 (161)	28.2 (289)	100.0 (1000)	51.2 (512)	17.6 (176)	31.2 (312)
20-39	100.0 (451)	49.2 (222)	13.5 (61)	37.3 (168)	100.0 (464)	49.8 (231)	15.9 (74)	34.3 (159)
40>	100.0 (343)	60.3 (207)	17.8 (61)	21.9 (75)	100.0 (332)	59.9 (199)	20.5 (68)	19.6 (65)
TOTAL	100.0 (1816)	55.1 (1001)	15.6 (283)	29.3 (532)	100.0 (1796)	52.4 (942)	17.7 (318)	29.9 (536)

Note: Full acceptance means acceptance of 2 injections and partial acceptance means acceptance of one injection. Figures in parentheses represent frequency.

and 15.6% accepted 1 injection. The total non-acceptance group accounted for fewer than one-third (29.3%) of all eligible women.

Interaction with other services:

The particular evolution of the Matlab MCH-FP programme permitted an examination of two questions related to the interaction of tetanus vaccine services with other health services. First is possible adverse consequences of one year of family planning services, including a long-acting injectable contraceptive, on tetanus immunization acceptance during pregnancy. Second is the possible facilitating effect of the tetanus immunization programme on subsequent adoption and use of oral therapy for diarrhea. These operational issues are inherent in the natural evolution of the integrated Matlab MCH-FP programme.

Table 7 shows ever use of contraceptives by acceptors and non-acceptors of tetanus immunization. Although acceptors of tetanus immunization seem to have a higher proportion of women using contraception previously (18.8%) in comparison to the non-acceptors of immunization (14.1%), the differences are very modest. These findings do not support the apprehension that previous provision of injectable contraceptives, particularly experience of its side effects, discouraged women from accepting tetanus immunization. Since the data in this table involve individuals, and not the overall community, the conclusion can only be related to previous individual practice of contraception. No conclusions are possible about community-wide attitudes toward tetanus immunization, after family planning injections were provided.

Figure 4a and 4b illustrate adoption and use of oral therapy for diarrhoea by families of acceptors versus non-acceptors of tetanus immunization. The diarrhea attack rates between these two groups are not known, and for the purposes of this analysis has been assumed to be comparable. If so, Figure 4a shows that the percent of families using oral therapy among the families of immunization acceptors in the first 6 months of oral therapy services was significantly higher than that for non-acceptors ($P < .05$). Figure 4b shows that this difference is even greater in terms of consumption of oral therapy. On an average, a family of an immunization acceptor consumed 1.6 packets of oral therapy in comparison to 1.4 packets by non-acceptor families over the first 6 months of 1979. These data suggest that tetanus immunization acceptance is associated with more frequent and higher quantity of subsequent oral therapy use. Whether such an association is due to family differences, where some families are more likely to adopt all forms of modern health ecthnologies more readily than others or whether the increased rapport between worker and families consequent upon delivery and acceptance of tetanus immunization service facilitated subsequent use of oral therapy are simply not known.

TABLE 7

EVER USE* OF CONTRACEPTION BY ACCEPTORS AND NON-ACCEPTORS OF TETANUS IMMUNIZATION DURING PREGNANCY IN MATLAB, SAMPLE SURVEY (SEPTEMBER 1978 - AUGUST 1979)

	Ever use by method					
	All	Pills	Injectables	Others	Never Use	All
Acceptors	53 (18.8)	30 (10.6)	16 (5.7)	7 (2.5)	229 (81.2)	282 (100.0)
Non-Acceptors	34 (14.1)	20 (8.3)	13 (5.4)	1 (0.4)	207 (85.9)	241 (100.0)
ALL	87 (16.6)	50 (9.6)	29 (5.5)	8 (1.5)	436 (83.4)	523 (100.0)

The figure in parentheses represent percentage

* Used any time before this pregnancy.

Fig : 4(a)

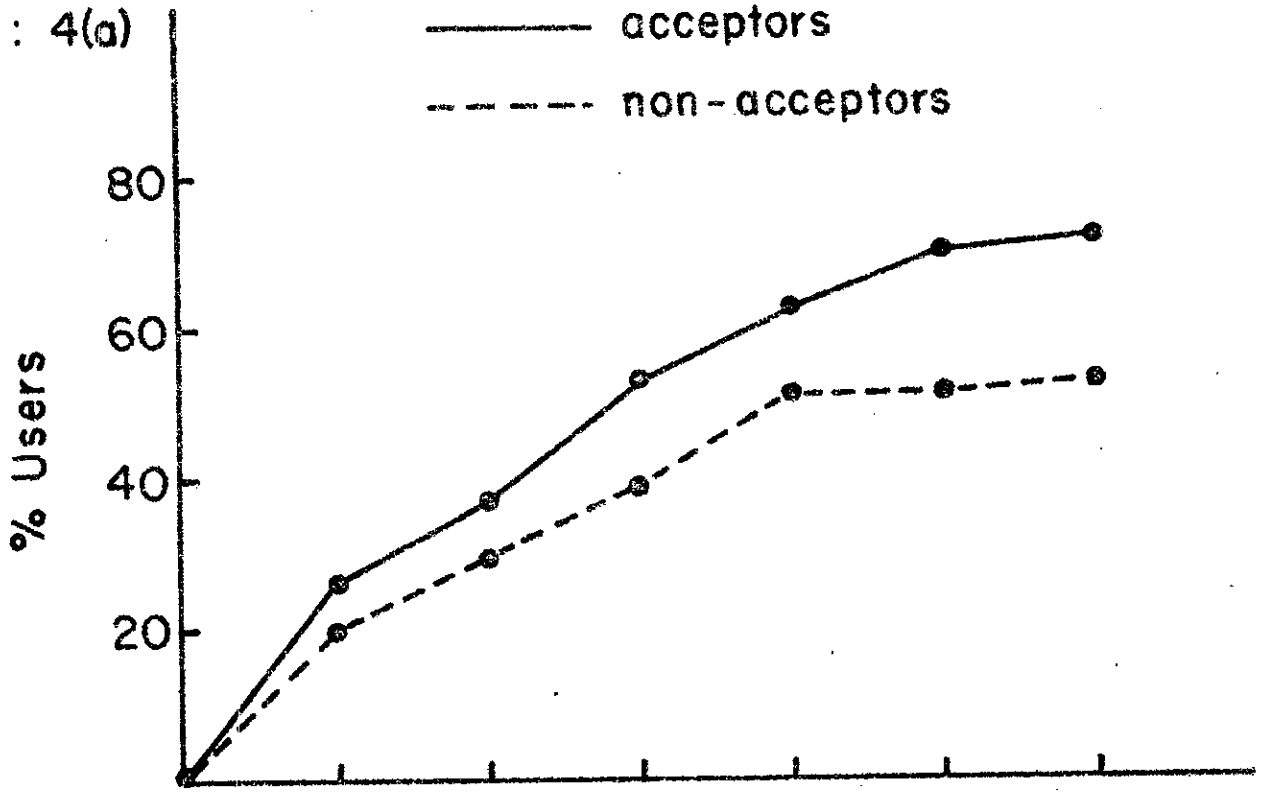
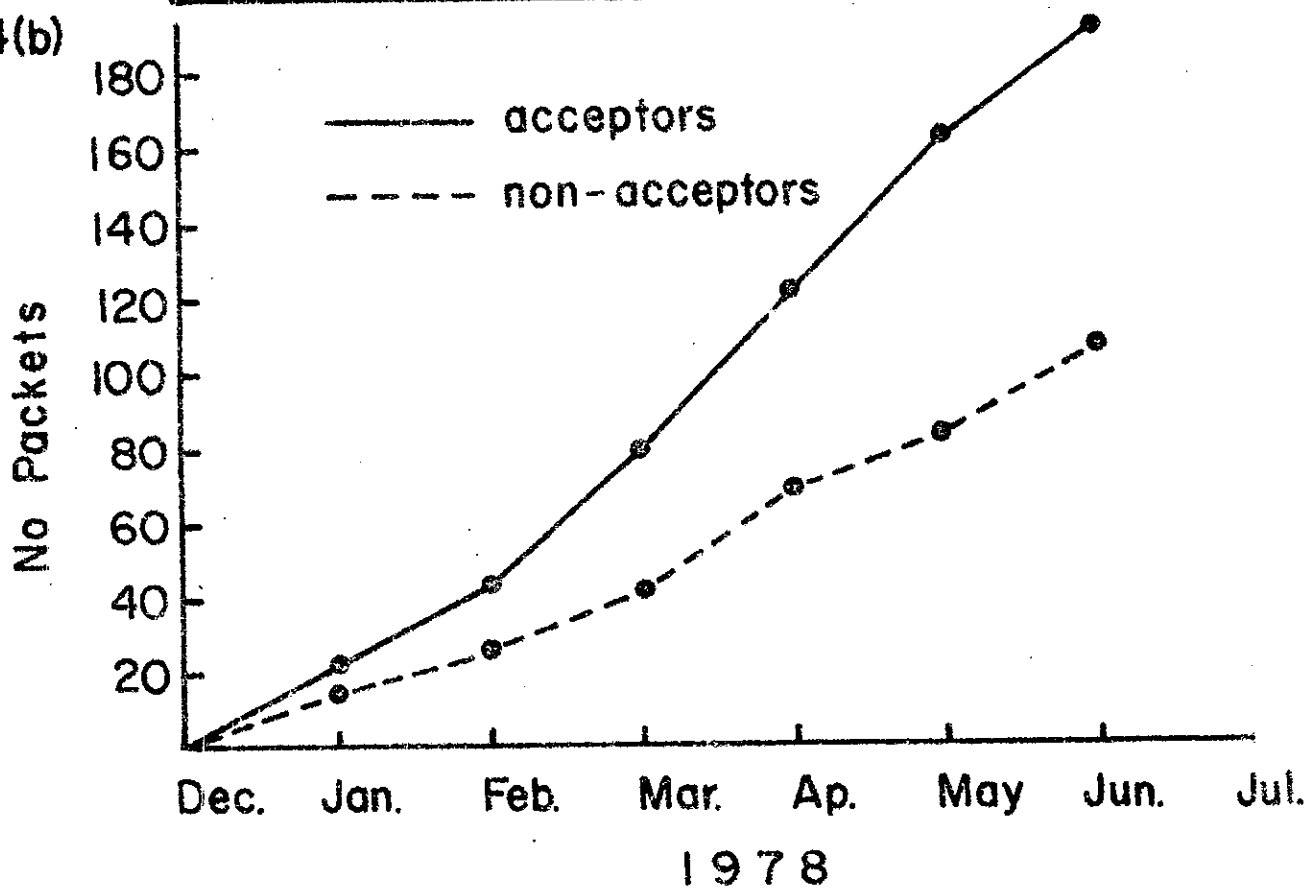

acceptors
non-acceptors
% Users
80
60
40
20

Fig : 4(b)


acceptors
non-acceptors
No Packets
180
160
140
120
100
80
60
40
20
Dec.
Jan.
Feb.
Mar.
Ap.
May
Jun.
Jul.
1978

DISCUSSION

Some discussion of the uniqueness of the Matlab study area and population and the ICDDR,B MCH-FP programme is in order before the study's findings are interpreted. The geography and ecology of Matlab is a densely-populated, low-lying flat alluvial plain intersected by many rivers and canals, making communication and logistics difficult. It is no means typical of either South Asia or even Bangladesh. The Matlab study population, moreover, is unique. Over the past 17 years, the ICDDR,B has conducted 5 cholera vaccine trials, has operated a demographic surveillance system, and has provided diarrhoeal treatment services to the population. The interactions and rapport between the ICDDR,B and the community are therefore strong and intimate. Finally the Matlab MCH-FP programme offered only family planning services, including injectable contraceptives, in the first 9 months. Tetanus immunization was incorporated later, and even later still were oral therapy services offered at the community-level. It should be recognized that the Matlab MCH-FP programme was basically an experimental research programme supported by sophisticated, well-organized administrative, scientific, and logistical resources of the ICDDR,B. As such, attempts should not be made to generalise to other activities operating under entirely different circumstances. The intent of this study, rather, is to dissect out the lessons learned from this experience that may be of possible relevance to other tetanus immunization activities.

Despite this limitation, the Matlab experience reported in this paper possess some unusual characteristics as well. Firts, the operation of an independent demographic/epidemiologic data collection system by the ICDDR,B in the same population provided a unique and reliable data base to assess programme coverage and acceptance rates. Secondly, the sequential introduction of specific health services in the MCH-FP programme permitted examination of possible influences between one activity upon the performance of another. Thirdly, the implementation of service delivery by an organization with solid administrative, scientific, and logistical capacity ensured adequate "cold-chain" procedures for vaccine preservation and a sufficiently effective delivery system to assess factors associated with programme performance. Finally, the Matlab study area also witnessed in 1974 a cholera vaccine trial in which tetanus immunization was provided to non-pregnant women as a control vaccine. Comparison of acceptance was therefore possible between the two strategies of immunizing pregnant versus non-pregnant mothers in the same population.

The study's findings suggest that despite an intensive and well designed delivery system, identification rates of eligible pregnant women by any programme are not likely to exceed 90%. One factor responsible is simply the enormous demand placed upon the delivery system and field workers to identify all eligible women continuously and reliably in the midst of heavy overall work loads. Some Matlab mothers, particularly young women, were also uncooperative in informing workers of pregnancy because of shyness or superstition. In other cases, women conceived during postpartum amenorrhea, and in the absence of postpartum monthly mensturation, could not be certain of pregnancy until very

advanced stages. Finally, migration of women into or out of the study area, either temporarily or permanently, made timely identification difficult.

Even with timely identification and ready availability of vaccine in the homes, vaccine acceptance was disappointingly low, approximately one-third of identified women. An inescapable conclusion is that client-related factors were primarily responsible and that, at least in Matlab, there was strong community reluctance to accept vaccination of women during pregnancy for fears of harming the fetus. Improved worker performance (suggested by improved coverage) over time failed to result in improved acceptance levels. One possible factor inhibiting a positive trend was the community's imprecise diagnosis and perception of tetanus deaths, thereby resulting in neonatal tetanus deaths among vaccinees from causes of death which, according to local nomenclature, overlap with that of true tetanus. Finally, the lack of differentials in socioeconomic characteristics between acceptors and non-acceptors failed to provide clues as to why some accepted and others were not willing to do so.

The hypothesis that previous provision of family planning services, particularly injectable contraceptives, may have strengthened resistance to vaccination during pregnancy was not confirmed. When acceptors and non-acceptors were examined with regard to previous contraceptive usage, no consistent pattern was noted. Given this lack of differentials, firm conclusions on the potential negative role of family planning on subsequent vaccine appeptance during pregnancy could not be drawn. In contrast, among randomly selected households, those who had accepted tetanus immunization appeared subsequently to adopt usage of oral therapy sooner than non-acceptors. This relationship was even more marked in terms of oral therapy consumption levels. One explanation of this relationship is that the acceptors' satisfactory experience with tetanus immunization facilitiated subsequent oral therapy adoption. Another explanation, perhaps more plausable, is that no causative relationship was involved but that in any given community some households are likely to adopt a variety of modern medical technologies earlier than others.

Overall, the study's findings are strongly suggestive that a tetanus immunization programme aimed exclusively at pregnant mothers is not likely to be effective in geo-cultural settings such as Matlab. Identification, information dissemination, and vaccine preservation, transport, and delivery all depend upon a difficult-to-maintain, highly efficient and effective delivery system. Acceptance by the community also may be less than optimal, and improvements over time may be slow to be realized. In comparison, the mass vaccination campaign approach, such as the 1974 Matlab cholera vaccine trial, generated significantly higher acceptance rates among non-pregnant women (of course, we do not know exactly whether this high acceptance rate could be achieved if the women were told that the vaccine was meant for protection of neonates against tetanus death). But as a policy, mass campaigns also possess constraints. Even with extensive manpower deployment modern transport logistic support, and community rapport, the acceptance rate in 1974 was only slightly higher than 55%. Moreover, the vaccine trial was conducted at the expense of regular longitudinal surveillance and health services work being undertaken in

Matlab. The study's findings therefore speak strongly for the need of individual national programmes to tailor their strategic choices to their own unique circumstances. In the rural Bangladesh setting, our recommendations from the Matlab experience would be vaccine campaigns backed up by immunization during pregnancy. The vaccine campaigns would have the advantage of easier logistics in terms of "cold-chain" maintenance of the vaccine and presumed higher levels of vaccine acceptance by non-pregnant women. Human resources devoted to these campaigns however should not disrupt the long-term development of village-based basic health services, which would also identify and offer vaccine to pregnant women. It should be recognized that it will take many years before an effective rural health infrastructure will be sufficiently developed for the latter approach to shoulder most of the load associated with protecting all neonates against tetnaus.

SUMMARY

Beginning in June 1978, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) initiated a programme of immunizing pregnant women with tetanus toxoid in conjunction with the implementation of a village-based maternal-child health and family planning programme in its field station area at Matlab, Bangladesh. The female village workers (FVWs) of the ICDDR,B identified eligible pregnant women during their fortnightly home visits and delivered vaccine to the homes of interested women.

In the beginning, the rates of identification of eligible pregnant women and acceptance of vaccination were poor. The identification rate increased steadily as the programme matured, reaching over 88% of all pregnant women in the 4th 4-month period of the programme. The acceptance rate, however, remained low, only about 34% of identified pregnant women accepted full immunization (2 injections) and about 5% accepted partial immunization (1 injection). The major reported reasons for non-acceptance were objection by husbands and in-laws fear of women due to lack of experience with injections during pregnancy, fear from village rumours and failure of workers to inform pregnant women women about vaccination early enough. The most frequently reported reason for failure to accept the second injection was the departure of the women from their usual residence in preference of confinement in their parents' house.

One important observation of this study was the constraints in the community diagnosis of neonatal tetanus adversely affecting perception of the cent-percent effectiveness of the vaccine. Women were given the idea that tetanus injections were intended to protect against three traditionally recognised syndromes (known in Bengali as *alga, takuria* and *dhanustonkar;* when, infact, these syndromes are often caused by non-tetanus related diseases. Thus, when mothers misdiagnosed neonatal deaths among tetanus immunized neonates, they

mistakenly believed that the immunization was ineffective.

The findings of this study did not support an apprehension that previous provision of injectable contraceptive, particularly experience of its side-effects, had discouraged women from accepting tetanus immunization. The families of tetanus vaccination acceptors appeared to adopt usage of home-based oral therapy for diarrhoea sooner than the families of tetanus vaccination non-acceptors. This suggests that in the community some households were likely to adopt a variety of modern medical technologies earlier than others. However, a comparison of acceptors and non-acceptors of tetanus vaccination showed little differences between the two groups in terms of their socio-demographic characteristics.

A comparison of acceptance rates in the present programme and in the ICDDR,B, 1974 mass vaccination programme appeared to suggest a better prospect for a mass campaign tetanus vaccination programme. Both the strategies have, however, their unique limitations. In the rural Bangladesh setting, our recommendations from the Matlab experience would be vaccine campaign backed up by immunization during pregnancy.

LEGEND FOR FIGURES

Figure 1 Map showing villages of Matlab field surveillance area under the MCH-FP services and comparison.

Figure 2 Number of villages by rates of identification of eligible women by workers for vaccination in four 4-month periods.

Figure 3a Regression coefficients for effects of identification of eligible women by workers on acceptance of vaccination in first 4-month period of the programme.

Figure 3b Regression coefficients for effects of identification of eligible women by workers on acceptance of vaccination in fourth 4-month period of the programme.

Figure 4a Percentage of users of oral therapy for diarrhoea among the families of acceptors and non-acceptors of tetanus vaccination by month.

Figure 4b Cummulative number of oral therapy packets consumed by the families of acceptors and non-acceptors of tetanus vaccination by month.

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