

Implementing a nationwide insecticide-impregnated bednet programme in The Gambia

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Earlier studies in The Gambia suggested that the use of impregnated bednets might prove to be a useful malaria control strategy. Based on the results of these studies, in 1992 the Government of The Gambia was encouraged to initiate a National Impregnated Bednet Programme (NIBP) as part of the National Malaria Control Programme Strategy. This paper describes the implementation process/procedure of the NIBP. Evaluation results showed that, overall, 83% of the bednets surveyed had been impregnated, and 77% of children under the age of five years and 78% of women of child-bearing age were reported to be sleeping under impregnated bednets.

Introduction

Malaria remains one of the major health problems of The Gambia, as is the case in much of tropical Africa. Mortality surveys suggest that malaria and acute respiratory tract infections are the most frequent causes of death among children under the age of five years living in rural areas (De Francisco et al. 1993). Each year approximately 800 children are admitted to the paediatric department of the Royal Victoria Hospital with severe malaria (Brewster and Greenwood 1993). Children in rural areas of The Gambia experience around one clinical attack of malaria a year and malaria is a frequent cause of presentation at out-patient clinics. For these reasons, malaria control is given a high priority by The Gambian Ministry of Health.

Treatment of presumptive malaria attacks by Village Health Workers (VHWs), chemoprophylaxis given by VHWs and bednets have all been investigated as possible control measures (Greenwood and Pickering 1993). Bednets are used widely in many parts of The Gambia and early studies suggested that bednets impregnated with the insecticide Permethrin might prove to be a useful malaria control measure (Snow et al. 1987; Snow et al. 1988a; Snow et al. 1988b). This has been proved to be the case; a large trial involving a population of 22 000, undertaken in the centre

of The Gambia, demonstrated a marked reduction in mortality among children aged 1–4 years who slept under insecticide-impregnated bednets (Alonso et al. 1991).

These encouraging results led the Ministry of Health (MOH), with support from the World Health Organization (WHO), to initiate in 1992 a National Impregnated Bednet Programme (NIBP). The objectives of this programme are the introduction of insecticide impregnated bednets into all Primary Health Care (PHC) villages in The Gambia (villages with a population of 400 or more) over a two-year period and the introduction of a system of cost-recovery that will allow this intervention to be sustained. The objective of the first year of the programme (1992) was to introduce insecticide-impregnated bednets into half of the PHC villages in The Gambia, approximately 200 PHC villages with a population of around 200 000. In this paper, we describe how the NIBP was developed and present the results of a survey which showed that the initial objective was successfully achieved.

Malaria in The Gambia

Plasmodium falciparum is the dominant malaria parasite in The Gambia and is responsible for nearly all serious infections in children. Spleen and parasite

rates in children under the age of 10 years average around 40–50% in rural areas (Greenwood et al. 1987), tending to be higher on the south bank of the river Gambia than on the north bank and higher in eastern rather than western parts. However, much lower rates (< 10%) are found in periurban areas (Lindsay et al. 1990).

Throughout The Gambia, malaria transmission is seasonal and nearly all clinical cases occur during the rainy season and immediate post rainy season (Greenwood et al. 1987). All the significant malaria vectors in The Gambia belong to the *An. gambiae* species complex. In most areas *An. gambiae s.s.*, a strongly anthropophilic and predominantly night biting [10pm–6am] vector, is the dominant subspecies (Lindsay et al. 1989). However, in the western half of the country, where the river is still saline and where there are large swamps, *An. melas* is abundant and may play some part in malaria transmission, although it is a poor vector (Bryan et al. 1987)

Implementation of the NIBP

In order to meet the first objective of the NIBP, introduction of impregnated bednets into half of the PHC villages in The Gambia, the following strategies were adopted.

Sensitization

Sensitization sessions were organized and held with officers from the government, non-governmental organizations and interested parties at all levels of the health care delivery system, including the village hierarchy. The content of these sessions focused on malaria as a priority health problem in The Gambia, current control strategies, their strengths and weaknesses, NIBP, its objectives, strategies, activities and the role of different agencies/individuals in its implementation. Copies of the Project Document were also distributed to all officers for their review and retention.

Awareness campaign

During the months preceding bednet impregnation, the nature and objectives of NIBP were disseminated to the general public, health workers, extension workers and community leaders. Direct discussions at the village level on the benefits of impregnated bednets were reinforced by the media options listed below. Assessment of the knowledge of the cause of malaria in five West African communities including

The Gambia revealed that knowledge was low. People were more concerned about mosquitoes being a nuisance than a cause of the infection (Aikins et al. 1994). In view of the fact that bednets were used to protect the rural communities against mosquito bites, amongst others, the aim of the awareness campaign was to encourage people to buy a bednet if they did not already possess one and to participate in the bednet impregnation programme. A variety of educational media were used.

Posters

Two thousand copies of two types of posters, that had been pretested during the previous year (1991) and which demonstrated the impregnation process/procedure, were distributed to the Regional Health Teams (RHTs) and non-governmental organizations (NGOs) for circulation among their staff and communities.

T-Shirts

Three hundred T-shirts illustrating impregnation of bednets were produced and distributed through the existing structure of the MOH and NGOs for use by field workers and other staff involved in the project.

Radio programmes

Several months before the scheduled date for the bednet impregnation, radio interviews were held with the management team and broadcast on national radio in several local languages as serialized radio programmes. These discussed malaria control in general and the NIBP in particular. Subsequently, short radio spots and dramas were developed describing the use of impregnated bednets and the impregnation process. These were broadcast in local languages several times per week.

Video

A local video production on bednet impregnation was made in the main local languages in collaboration with the Film Unit of the Ministry of Information and Broadcasting. This was distributed to RHTs (which possess TV monitors and VCRs) and NGOs.

Training

The initial stage of the training exercise was a briefing by the Project Manager of the RHTs and NGOs involved in the project on the objectives and nature of NIBP. Training of members of the next tier – staff of the health centres, dispensaries and key villages – was held in the context of existing monthly in-service training sessions. These sessions were found to

be very helpful in identifying possible areas of difficulty in the implementation of the programme. At the village level, training of CHWs was determined by whether or not the staff had participated previously in a bednet impregnation exercise. For the former, training consisted of reorientation whilst the latter group received practical training on the impregnation of bednets as well as a refresher course on the diagnosis and management of malaria.

Supply management

Quantification

The basis of computing the need for supplies was the size of the village and its bednet census. Based on previous experiences, it was estimated that about 180 twenty-litre drums of 20% Permethrin would be needed to cover the target 200 PHC villages in Year 1 of implementation (1992).

Ordering

As it was anticipated that insecticide would be supplied through WHO and/or UNICEF, no provision had been made in the original budget for the purchase of insecticide. NIBP therefore solicited assistance from UNICEF, Action AID The Gambia, SCF (USA), SCF (UK) and other NGOs operating in The Gambia before the start of the 1992 rainy season and sufficient pledges to support the 1992 programme were obtained. As bednet impregnation was scheduled to start mid-June 1992, orders were placed by February/March 1992.

The rest of the logistic supplies (measuring cups, funnels, 1 litre cups and 5 litre containers) were ordered locally.

Receipt

All supplies were received by the end of May/beginning of June 1992 by the MRC's Supplies Officer and forwarded to NIBP Management, MRC, Fajara, as the consignee.

Storage

The storage needs were minimal as the holding period was very short. However, care was taken to ensure that insecticide was kept in a well-ventilated, designated store.

Distribution

After the needs of different health regions were computed, the insecticide and the rest of the logistic

supplies were distributed directly to the RHTs and/or NGOs for onward distribution to the key village and subsequently to the other villages. Four-wheel drive vehicles (already allocated to each RHT), in addition to two four-wheel drive vehicles from the central pool, were used to distribute the insecticide and other logistic supplies to the RHT level, whence onward distribution to the key village level was effected, again using four-wheel drive vehicles. From the key village level to the village level, CT 110 Honda motorbicycles (provided by UNICEF to MOH) were used.

In some circumstances the distribution was effected with the RHTs. This occurred when there were resource constraints at the health region level. Following the distribution exercise, which took four days, a countrywide trek was undertaken to check on supplies. During this tour, adjustments were made to the volume of insecticide required by some teams.

Bednet impregnation

Bednet impregnation was carried out under the overall supervision of the RHTs during a five-week period from June 17th to July 24th 1992. The technique of impregnation was similar to that successfully employed previously in The Gambia. Households were warned that their bednets should be washed and dried before impregnation. An appropriate day when women were not working in the fields was arranged with the communities. On the morning of impregnation, all bedsheets were removed from the beds and bednets brought down. A solution of insecticide (40ml of 20% Permethrin EC in two litres of water) was prepared in a large plastic/steel bowl. The measurement was usually undertaken by the VHW, who was provided with heavy duty gloves. Women were then asked to bring their bednets and to soak them in the insecticide.

To monitor the origin and number of bednets to be impregnated, a compound to compound impregnation strategy was recommended. After excess insecticide had been wrung out, bednets were placed on the mattress of the appropriate bed to dry. Bednets were then marked with indelible and washable markers so that it could be determined if bednets were washed subsequently. Women were then asked not to wash their impregnated bednets until the end of the rainy season (five months). When all the bednets in a compound had been so impregnated, the team then moved to the next.

Evaluation

Five months following the bednet impregnation exercise, which took a period of one month, a national survey was undertaken to determine the level of coverage achieved, to ascertain the acceptability and use of impregnated bednets by the target groups and to establish how effective the preceding sensitization exercise had been. A cross-sectional survey was undertaken employing a stratified, multistage sampling procedure proportional to size. The sampling frame was PHC villages covered during the 1992 impregnation exercise. Twenty PHC villages in each of the three health regions and six compounds in each PHC village were selected using random numbers from a list of PHC villages with an estimate of their size. Compounds within the villages were selected using a modified EPI cluster survey methodology.

The total number of PHC villages covered was 221, 10% more than the 1992 targeted number of PHC villages. The level of coverage found for bednets usage overall was 73% whilst that of bednet impregnation was 83%. Bednet coverage was highest in the Central Region (~90%), where the initial Gambian bednet trials had been done. Coverage was highest amongst the Mandinka ethnic group (82%).

In order to evaluate the impact of NIBP on mortality and morbidity from malaria, five sentinel zones were established in ecologically different areas of the country (Thompson et al. 1993). During the first year of intervention, a 25% reduction was achieved in

all-cause mortality in children 1–9 years old living in treated villages (RR 0.75, [95% CI 0.57–0.98], $p = 0.04$). If zone 5 is excluded, a 38% (RR 0.62, [95% CI 0.46–0.83], $p = 0.001$) reduction in mortality was found (D'Alessandro et al. 1995). Table 1 shows bednet coverage by zone. Bednet usage was lowest in zones 4 and 5 in the eastern part of the country.

Children under five years and pregnant women are the groups most at risk from malaria and those most likely to benefit from bednets. Table 2 shows the proportion of children under the age of five years reported to be sleeping under impregnated bednets by health region. Table 3 shows coverage levels for women aged 15–45 years. Overall, 77% of children under the age of five and 78% of women of child-bearing age were reported to be sleeping under impregnated bednets in programme villages.

The radio programmes were found to be the most effective component of the health education campaign.

Discussion

The transfer of a successful intervention against an infectious disease from a pilot study carried out under carefully controlled conditions to an effective public health measure is not easy. Serious problems may arise with logistics and supervision. In this paper, we have described how studies with impregnated

Table 1. Bednet coverage and insecticide-impregnated bednet coverage by study zone

Zone	Bed count	Beds with net		Beds with impregnated net	
		No.	%	No.	%*
1	152	98	64.5 [56.5–72.5]	88	89.8 [83.8–95.8]
2	42	38	90.5 [81.5–99.5]	36	94.7 [87.7–101.7]
3	192	184	94.4 [91.4–97.4]	154	83.7 [78.7–88.7]
4	304	146	48.0 [42.0–54.0]	132	90.4 [85.4–95.4]
5	275	156	52.9 [46.9–58.9]	136	87.8 [82.8–92.8]
Overall	998	622	63.0 [60.0–66.0]	546	87.8 [84.8–90.8]

* Indicates % nets that were treated.

Table 2. Proportion of children under the age of five years sleeping under impregnated bednets (IBNs) by health region, 95% CI shown in parentheses

Region	No. surveyed	Children under five years Sleeping under IBNs	
		No.	%
Western	403	284	70.5 [61.2–79.8]
Central	584	504	86.3 [72.7–92.1]
Eastern	605	434	71.7 [57.9–85.6]
Overall	1592	1222	76.8 [69.0–83.6]

Table 3. Proportion of women aged 15–45 years sleeping under impregnated bednets (IBNs) by health region, 95% CI shown in parentheses

Region	No. surveyed	Women 15–45 years Sleeping under IBNs	
		No.	%
Western	464	319	68.8 [61.3–75.3]
Central	559	478	85.5 [74.2–93.3]
Eastern	563	447	79.4 [67.7–90.0]
Overall	1586	1244	78.4 [71.9–83.1]

bednets in The Gambia have been expanded from pilot, carefully controlled trials to the first phase of a national programme. Although The Gambia is small, making this exercise easier than it might have been in other countries, introduction of a national programme of bednet impregnation was, nevertheless, an ambitious undertaking.

Surveys undertaken shortly after the impregnation exercise confirmed that the project had succeeded in its main objective. Overall, 83% of the bednets surveyed had been impregnated and 77% of children under the age of five were reported to be sleeping under impregnated bednets. Mortality was reduced significantly among these children (D'Alessandro et al. 1995). Possession of bednets varied by region and by ethnic group, as previously noted (MacCormack

and Snow 1986), with bednets being found most frequently in the central region and among Mandinkas. Surprisingly, bednets were impregnated less frequently in the central region than in other regions, perhaps due to a delay in the distribution of insecticide in this region.

The widespread appreciation of bednets in The Gambia, unusual in West Africa (Aikins et al. 1994), has undoubtedly played an important part in the initial success of NIBP. This was reinforced by an intensive programme of education undertaken before the impregnation exercise. The radio programmes, video production on impregnation process/procedure and posters appear to have reached the target population. Health workers reinforced the educational messages disseminated through the media. The fact that impregnated bednets were found more frequently in sites selected for epidemiological evaluation than in those that were not suggests that increasing awareness of the value of impregnated bednets, by whatever means, increases coverage.

The impregnation exercise was decentralized as far as possible, with supervisory roles being given to regional health teams. The mechanics of impregnation were undertaken by VHWs, TBAs or other village women. Thus, implementation was accomplished through a delivery system which, although it needed some reinforcement, was already established. Implementation of large-scale bednet programmes would be more difficult in communities where this is not the case.

The main problems encountered in the implementation of the NIBP included a weak management information system at the intermediate level of the health care delivery system and constrained resources for logistic support. A further aggravation of the situation was the shortage of community organizational skills at the management level.

To initiate the first phase of NIBP, insecticide was provided free. The costs of the insecticide, approximately US\$56 770 for the 71 313 bednets impregnated, were met by contributions from the government and from a variety of NGOs. However, it is uncertain whether such support will be sustained. Programme delivery costs and cost-effectiveness aspects of NIBP are discussed in Aikins et al. (in press). To impregnate all bednets in The Gambia would, despite its small population of only one million

(Population Databank 1993), cost around US\$100–200 000 per year. Such costs are beyond the scope of the Ministry of Health without additional assistance. Therefore, the only way of sustaining such a programme is likely to be through some form of cost recovery. This approach is now being explored.

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