Scientific Research Publishing

Assessing Community Health Interventions in Reducing Infant and Child Mortality in the Southeastern Benin

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Abstract

Background: To reduce infant and child mortality in Benin, a package of high-impact interventions per healthcare level was implemented in 2009. This study aimed to assess the quality of community-based health interventions in reducing infant and child mortality within the municipality of Pobè in southeastern Benin. **Methods:** This was a cross-sectional evaluative study carried out in November 2021 focused on children aged 0 - 59 months, their mothers, health workers, community facilitators, community health workers and the Town Hall health focal point. Mothers and their children were targeted by cluster sampling, and exhaustive selection was used to recruit all other participants. Predetermined scores based on rating criteria were used to assess the quality of community health interventions using the "input, process and outcome" of Donabedian approach. **Results:** Over 300 mother-child couples, 46 community health workers, 7 health agents, 1 community facilitator and 1 health focal point from Pobè town hall were surveyed. Intervention quality was judged as "average", with a score of 73.80%. The "inputs" and "outcomes" components were the weakest links. **Conclusion:** Improving access to the inputs needed by community health workers can enhance the quality of PIHI interventions.

Keywords

Community-Based Interventions, Infant and Child Mortality, Benin

1. Introduction

Among developing countries, five priority diseases are still responsible for around

70% of deaths among children under 5 [1]. The achievement of the Sustainable Development Goals (SDGs), which have mobilized the international community in recent years, devotes particular attention to reducing infant and child mortality, and calls for the establishment of essential services to ensure access for women and children [2]. High Impact Intervention Package (PIHI) was implemented in developing countries to improve mother and child health. Integrating a preventive nutrition package into facility-based screening for acute malnutrition during well-baby consultation in Burkina Faso increased participation in monthly acute malnutrition screening, thus overcoming a major impediment to community management of acute malnutrition effectiveness [3]. Community-based package of interventions on child development in Zambia was associated with an increase in weight-for-age, height-for-age and a reduction in stunting [4]. In South Africa, a pilot randomised controlled trial reported that an Incentive-Based and Community Health Worker Package Intervention had improved early utilization of antenatal care [5]. A systematic review of community-based intervention packages for improving perinatal health in developing countries reported that such interventions can have a substantial effect on neonatal and perinatal mortality [6]. Charle-Cuéllar *et al.* analyzed the impact of different levels of supervision on the recovery of severely malnourished children treated by community health workers in Mali and found that children treated by the community health workers who received some supervision had better outcomes than those treated by unsupervised community health workers [7].

In 2009, Benin's Health Ministry identified a set of evidence-based interventions with a positive impact on maternal, neonatal and child mortality, known as the High Impact Intervention Package (PIHI). The PIHI comprises a range of varied services and is suitable for implementation at different levels of the healthcare system, from community level to national referral hospitals [8].

In 2017, Pobè Health Zone benefited from the implementation of the community-based PIHI. To this end, several community health workers were selected and trained in recognizing general signs of danger or seriousness, managing common non-severe ailments, preventing them, visiting the homes of children aged 2 - 59 months, referring serious cases and directing pregnant women and the malnourished to the nearest health facility. It was necessary to evaluate the quality of the interventions offered by the community health workers after several years of implementation of the community-based PIHI.

2. Methods

2.1. Settings

The study was carried out within Pobè municipality, located in southeastern Benin. Comprising 58 villages and city districts, the municipality is divided into five boroughs. The commune's population was estimated at 146,835 [9].

2.2. Study Design and Population

This was a cross-sectional evaluative study carried out in 2021. Two types of target

population were included. Primary targets were children aged 0 - 59 months, mothers or babysitters and village community health workers. The secondary targets were the head nurses, the Pobè town hall health focal point, the project's community facilitator and the Pobè chief medical officer.

2.3. Sampling

2.3.1. Sample Size

The sample size for children aged 0 - 59 months was determined by the SCHWARTZ formula [9]:

$$n = kZ\alpha 2pq/i2$$

with:

- The error risk α we assumed was 5% for a 95% confidence interval hence $Z\alpha$ = 1.96;
- p (46.9%) was the percentage of children aged 0 - 5 years with fever for whom advice or treatment was sought according to the results of the 2017-2018 Demographic and health survey report [10];
- k (1.5) was the cluster effect;
- I = 0.07 was the desired accuracy for the results (7%).

   A total of 300 children aged 0 - 59 under to be divided into 30 clusters was required. Mother-child pairs were identified using the WHO two-stage cluster sampling technique.

2.3.2. Inclusion Criteria

The study included primary and secondary targets whose consent to participate in the study had been obtained.

2.3.3. Selection of Mothers or Babysitters

The selection of mothers or babysitters of children aged 0 - 59 months in the study localities (one mother for one child) was based on a probabilistic method using a two-stage cluster sampling technique adapted from World Health Organization.

2.3.4. Selection of Community Health Workers, Supervisor, Town Hall Health Focal Point, Community Facilitator and Chief Medical Officer

To select these categories of actors, we used the non-probabilistic method consisting in exhaustive choice.

2.4. Variables

The studied variables were composed of a principal component (quality of community-based health interventions to reduce infant and child mortality) and explanatory components: inputs, processes and outcomes (**Figure 1**) [11].

   For each component, the assessed variable was evaluated as follows: when the practice met the standards, a rating of "1" was assigned. If not, a score of "0" was assigned. The sum of the ratings gave the score obtained, which was expressed as a percentage of the expected score for each component. To assess the main
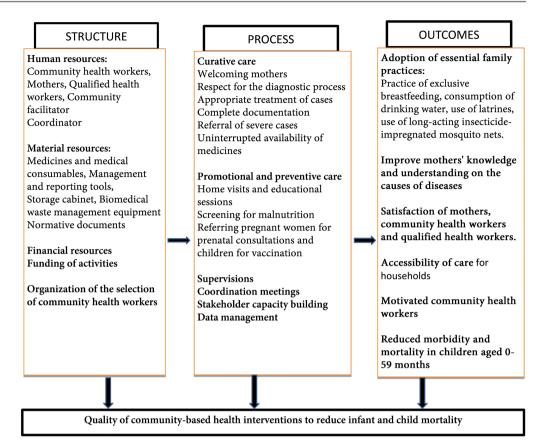
STRUCTURE	PROCESS	OUTCOMES
Human resources: Community health workers, Mothers, Qualified health workers, Community facilitator Coordinator **Material resources:** Medicines and medical consumables, Management and reporting tools, Storage cabinet, Biomedical waste management equipment Normative documents **Financial resources Funding of activities** **Organization of the selection of community health workers**	**Curative care** Welcoming mothers Respect for the diagnostic process Appropriate treatment of cases Complete documentation Referral of severe cases Uninterrupted availability of medicines **Promotional and preventive care** Home visits and educational sessions Screening for malnutrition Referring pregnant women for prenatal consultations and children for vaccination **Supervisions Coordination meetings Stakeholder capacity building Data management**	**Adoption of essential family practices:** Practice of exclusive breastfeeding, consumption of drinking water, use of latrines, use of long-acting insecticide-impregnated mosquito nets. **Improve mothers' knowledge and understanding on the causes of diseases** **Satisfaction of mothers, community health workers and qualified health workers.** **Accessibility of care** for households **Motivated community health workers** **Reduced morbidity and mortality in children aged 0-59 months**

Quality of community-based health interventions to reduce infant and child mortality

Figure 1. Community-based health interventions to reduce infant and child mortality: a conceptual diagram.

component, the sum of the scores obtained by the explanatory variables was related to the total expected score.

The percentages obtained for each component were assessed according to a three-level scale: "**good, average, insufficient**" adapted from Varkevisser's measurement scale [12].

If the percentage of achieved score was greater than or equal to 80% of the expected rating, the assessment was "**good**". If the percentage of achieved score obtained was between 60% (included) and 80% (excluded) of the expected rating, the assessment was considered "**average**". If the percentage of achieved score obtained was less than 60% of the expected rating, the assessment was qualified as "**insufficient**".

2.5. Data Collection Techniques and Tools

Data was collected by questionnaire survey, interview using an interview guide (semi-structured interview and focus group), observation using an observation grid, and documentary analysis using a data processing sheet. All these tools were designed by the authors.

2.6. Validity and Reliability of the Questionnaire

The challenge, in this research, is that the "gold standard tool" itself has not been

identified. We then appreciate the construct validity based on conceptual frame as there is no criterion for comparison. Since the questionnaire was generated from the conceptual diagram (Figure 1), its construct validity was assumed.

We used Cronbach's alpha coefficient to appreciate the internal consistency of a set of questionnaire items. Cronbach's alpha coefficient was 0.81 indicating an acceptable reliability of the questionnaire.

2.7. Data Analysis

Quantitative data were expressed as mean and standard deviation, whilst qualitative data were expressed as their proportion. Percentages of scores obtained in relation to the expected score were calculated.

3. Results

3.1. Characteristics of Surveyed Mothers and Children

The sample size of participants included 46 community health workers, 300 mothers-child aged 0 - 5 pairs, 3 nurses (men), 3 nurses (women), 1 community facilitator from the non-governmental organization Catholic Relief Service, 1 chief medical officer and 1 health focal point of Pobè town hall.

The mean age of the mothers was 28 ± 5.51 years. Among these mothers, 67.7% had never attended school, 60.66% were either farmers or craftswomen, and 93.67% were married. Half (50%) of the community health workers were aged between 21 and 30, and had a level of secondary school education (56.32%). Men predominated, accounting for 65.21% of them.

The characteristics of the surveyed mothers and children aged 0 - 59 months are shown in Table 1. The mean age of the nine other participants including 6 nurses, 1 community facilitator, 1 chief medical officer and 1 health focal point of town hall was 42 ± 4.503 years.

3.2. Assessment of Community-Based PIHI Structure, Process and Outcomes

Table 2, shows the inadequacy of the structure (53.28%), linked to the insufficiency inputs other than "malaria control inputs" such as of number of households with improved latrines (42%), number of households with a source of drinking water (31%) and number of households with a household solid waste management system (20.33%).

However, in Table 3, the quality of the process was good (81.80%). It should be noted that the population's participation in educational sessions was low (data not shown).

Outcomes shown in Table 4 were average (66.33%) linked to weak performance rate of children vaccination (65.33%), exclusively breastfeeding last child (41.33%) using an improved latrine by households (58.67%), recognizing at least two danger signs in children by mothers (56%).

Overall, the quality of interventions was average, with a performance rate of

Table 1. Socio-demographic characteristics of surveyed mothers and children.

	Headcounts (n = 300)	Proportion (%)
MOTHERS OF CHILDREN AGED 0 TO 59 MONTHS		
Level of instruction		
None	203	**67.7**
Primary	93	31.0
Secondary	4	1.3
Professional activity		
Farmer/craftsman	182	**60.66**
Employee	14	4.67
Retailer	104	34.67
Marital status		
Married/common-law	281	**93.67**
Single	11	3.67
Widowed	3	1
Divorced	5	1.66
Religion		
Christian	205	**68.33**
Muslim	89	29.67
Endogenous	6	2
CHILDRENS AGED 0 TO 59 MONTHS		
Sex of children		
Male	179	**59.66**
Female	121	40.33
Children's age range (months)		
0 - 5	21	**7**
6 - 35	88	29.33
36 - 59	191	**63.66**

Table 2. Assessment of the structure of community-based PIHI interventions in Pobè municipality.

Components of structure	Expected score	Achieved score	Performance (%)	Appreciation
Number of community health workers recruited during a village general meeting.	46	45	97.83	Good
Number of community health workers with all management and reporting tools.	46	46	100	Good
Number of community health workers supplied with medicines.	46	46	100	Good
Number of households with LLITNs in good condition.	300	296	98.7	Good
Number of households with improved latrines.	300	126	42	Insufficient
Number of households with a source of drinking water.	300	93	31	Insufficient
Number of households with a household solid waste management system.	300	61	20.33	Insufficient
Total	**1338**	**713**	**53.28**	**Insufficient**

LLITNs: Long-Lasting Insecticide-Treated Mosquito Nets.

Table 3. Assessment of the community-based PIHI process within Pobè municipality.

Components of process	Expected score	Achieved score	Performance (%)	Appreciation
Number of community workers who have received initial training on PIHI.	46	46	100	Good
Number of community health workers who have not experienced a shortage of ACT + RDT.	46	46	100	Good
Number of community health workers who have not experienced a break in other management drugs.	46	1	2.17	Insufficient
Number of community health workers taking part in group monitoring meetings over the last three months.	46	46	100	Good
Number of malaria cases receiving first-line antimalarial treatment in the community after RDT.	210	179	85.23	Good
Number of community health workers supervised at least once during the last quarter.	46	46	100	Good
Number of households having received at least one home visit.	300	184	61.33	Average
Number of educational sessions held in the last three months.	276	276	100	Good

Indicators	Expected score	Achieved score	Performance (%)	Appreciation
Number of mothers having contacted the relay at least once in the last three months for a health problem affecting their child.	300	238	79.33	Average
Number of mothers who know the community health workers in their locality.	300	255	85	Good
Number of community health workers complying with standards care and procedures.	46	46	100	Good
Number of community health workers producing monthly activity reports.	46	46	100	Good
Number of follow-up visits made to children's households.	300	226	75.3	Average
Number of community health workers correctly filling in tools.	46	37	80	Good
Number of community health workers correctly storing management tools and medicines.	46	46	100	Good
Total	**2100**	**1718**	**81.80**	**Good**

ACT: Artemisinin-based Combination Therapy; RDT: Rapid Screening Test.

73.80%. The weakest aspects of implementation were the "structure of community-based PIHI" and its "results", which were rated "insufficient" and "average" respectively (Table 5).

3.3. Overall Assessment of Community-Based PIHI Quality

Table 5 shows that the quality of community-based health interventions within Pobè municipality was average.

4. Discussion

Avedis Donabédian's approach [11] was used to assess the quality of PIHI's

Table 4. Assessment of the outcomes of community interventions within the municipality of Pobè.

Components of outcomes	Expected score	Achieved score	Performance (%)	Appreciation
Number of mothers recognizing at least two danger signs.	300	168	56	Insufficient
Number of mothers knowing the causes of malaria.	300	298	99.33	Good
Number of mothers knowing the causes of diarrheal diseases and respiratory infections.	300	225	75	Average
Number of mothers familiar with the child's vaccination schedule.	300	211	70.33	Average
Number of children having received all age-appropriate vaccines.	300	196	65.33	Average
Number of mothers who had at least one prenatal consultation during their last pregnancy.	300	272	90.66	Good
Number of mothers who gave birth with tetanus immunity during the last pregnancy.	**300**	**246**	**82**	Good
Number of mothers exclusively breastfeeding their last child.	300	124	41.33	Insufficient
Accessibility to community health worker's interventions.	300	300	100	Good
Number of children who slept under LLITN the day before the survey.	300	251	83.75	Good
Number of households consuming drinking water.	300	246	82	Good
Number of households using an improved latrine.	300	176	58.67	insufficient
Number of mothers satisfied with community health worker's interventions.	300	245	81.67	Good
Number of other stakeholders satisfied with CR work.	9	9	100	Good
Number of community health workers satisfied with their services.	46	46	100	Good
Number of community health worker benefiting from community support for the implementation of interventions.	46	46	100	Good
Number of deaths of children under five recorded in the community during the quarter in the households surveyed.	1	1	100	Good
Total	**4002**	**3060**	**76.45**	**Average**

LLITNs: Long-Lasting Insecticide-Treated Mosquito Nets.

Table 5. Assessment of the overall quality of community health interventions within the municipality of Pobè.

Components	Expected score	Achieved score	Performance (%)	Appreciation
Inputs	1338	713	**53.28**	**Insufficient**
Process	2100	1718	81.80	**Good**
Outcomes	4001	3059	**76.45**	**Average**
Quality of PIHI-com	7439	5490	73.80	**Average**

implementation of community-based health interventions. The study revealed that the structure was considered insufficient. However, the quality of the process was good and the outcomes were average. Ultimately, the overall quality of community-based health interventions in Pobè municipality was average. This assessment

approach based on structure, process and outcomes had already been used by several authors to evaluate the quality of community interventions [13] [14] [15] [16].

4.1. Quality of the Community-Based PIHI Interventions

Several evaluative studies of community-based health interventions have been undertaken around the world, though it should be noted that the aspects assessed varied from one study to another. Most published studies have assessed the quality of community health workers' services by direct observation of clinical encounters and by comparison with an evaluation of reference standards. Thus, at the end of the present study, the quality of interventions was average, with a score of 73.80%. The weakest links in implementation were "non-ILP inputs" and "outcomes", which scored "insufficient" and "average" respectively. This result is below that of Gahou, who found the quality of care to be good at So-Ava in 2018, with a score of 84.09% [13]. Despite this average performance, the gains made must be maintained and new efforts made to improve children's health throughout the municipality.

4.1.1. Knowledge General Danger Signs by Mothers

Recognition of danger signs is of vital importance in reducing infant mortality. In the study, less than 25% of mothers clearly mastered the 4 main danger signs, while 56% cited only two. This lack of knowledge is due to the fact that the majority of women do not attend the various monthly sessions organized by the RCs in their localities. This result is lower than that of Malou Adom *et al.*, where 99% of households in Benin and 92% in Togo are familiar with the clinical signs of these diseases [17].

4.1.2. Exclusive Breastfeeding

The majority of women breastfeed their children from birth, but the study showed that only 41.33% were exclusively breastfeeding until the age of 6 months. This result, although lower than the one reported in the national 2017-2018 demographic and health survey, is better than 50% in Burkina Faso, 33% in Mali and 37.5% in Senegal [18] observed in the study funded by the NGO "Action contre la Faim".

4.1.3. Use of Latrines

The survey results showed that only 42% of households surveyed had their own latrine. Despite this low rate of availability, 58.67% of households used latrines for defecation. This improvement can be explained by the introduction in certain localities by NGOs of public latrines for a fee, but also by the active solidarity that means that neighbors' latrines can be used by those who don't yet have one. Roy reported in his 2016 study that improved toilets have a significant protective effect against diarrhoea at all ages by reducing the spread of pathogens in excreta [19]. So, following the example of project set up in the Savanes and Kara regions of Togo, which resulted in 92 of the 167 villages in the Savanes region

being awarded the status of "end of open-air defecation" [12], the commune of Pobè has also set in motion the same process, which is currently being implemented with the contribution of the NGO OMIDELTA.

4.1.4. Use of Drinking Water for Drinking

In his study in Togo, Le Fur reported that 76% of households had access to drinking water [12]. This performance is close to that found in this study, where 82% of households used drinking water. This performance is below that found in SO-Ava in Benin by Léonie, where 99.11% of households had access to drinking water [20]. This discrepancy between SO-AVA and this study may be linked to the fact that many efforts had been focused in this region by NGOs and the central government to reduce the recurrent occurrence of fatal diarrhoeal diseases in the region.

4.2. Strengths and Weaknesses in Implementing Community-Based PIHI Interventions

Every intervention's success depends on the quality of the resources mobilized and the managerial style established. The average performance obtained in the evaluation of interventions in the municipality was mainly due to the acceptance of the community health workers in their locality, to the availability of malaria control inputs and above all to the supervision, ongoing training and motivation of the community health workers.

Gray *et al.* in his technical folder for the forum on community management of acute malnutrition entitled "community engagement" recognized the need to motivate community health workers but mentioned that it was important to stress that remuneration was not the only solution and that, on its own, it would not be able to maintain staff motivation or the quality of care [21].

To improve performance, it will be necessary to maintain the gains made by mobilizing additional financial resources through the communal council to ensure the sustainability of activities, but also and above all to encourage greater community involvement. According to Gray *et al.*, it is through a good knowledge of their health needs and their active participation in the provision and management of health services that communities strengthen their ownership of health interventions. Most communities have some form of local organization or structure capable of expressing the needs of the community. Despite this, the process was good, demonstrating the ability of community health workers to work in a context of limited resources. In Malawi, for example, a key factor in the successful scaling-up of community-based care was the creation of village health committees: these were linked to each village health center, and community leaders were put in charge of their management [21].

In short, all stakeholders will need to work together to find solutions to the shortcomings noted above all in the non-availability of inputs other than "malaria control inputs", and the low level of participation by the population in educational sessions designed to enable them to adopt behaviors conducive to re-

ducing mortality and morbidity in children under 5.

The limitations of the present study lie in its limited scope. The results can only be generalized to the population of the commune of Pobè. Furthermore, desirability bias is possible since mothers know the best practices to be observed to improve their children's health. Answers could be modified accordingly. However, the results reported in this community-based study are very useful for the implementation of PIHI.

5. Conclusion

The assessment enabled us to evaluate the quality of PIHI's community-based interventions carried out by the community health workers, and their impact on the beneficiaries, namely women and children aged 0 - 59 months in the municipality of Pobè. On completion of the evaluation, the quality of the interventions was judged to be average. The weakest links in the implementation of community interventions were the "structure" and "outcomes" components that need to be improved.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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