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Short Term Effects of Performance-Based Financing on Maternal and Child Health Services in the MIFI Health District

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Improving maternal, neonatal and child health are two of the most critical Sustainable Development Goals (MDGs). The Cameroon health system has consistently faced huge challenges to meet these objectives. As upshot; decision-makers identified the lack of a suitable health financing policy as an important issue that needed to be addressed. In response; the performance- based financing (PBF) scheme was implemented.
Objective of Study: Assess the short term effects of PBF on both maternal and child health services.
Methods: An analytical cross-sectional study was carried out in the Mifi Health District to compare the trend in some key child health indicators before and after PBF's implementation across 41 randomly selected health facilities. A linear regression model and a paired sample T-test were used in the analysis, considering a p-value of <0.05 as significant and a confidence interval at 95%.

Results: There was a significant decrease in the mean Pentavalent dropout rate (p-value=0.02) as well as in the mean number of child deaths (p-value=0.019), per facilities per year from 26.61 and 0.46 before, to -104.07 and 0.15. There was also a significant increase in the proportion of women per facility per year who came for first antenatal care visit (ANC) p=0.001 from 94.55 before to 229.71 during PBF. The mean number per facility per year of pregnant women who attended at least 4 ANCs (p=0.034) also increased significantly from 44.65 before to 119.05 during PBF. Equally, the mean number of women per facility per year attending post natal visits significantly increased (p=0.010) from 23.23 before to 75.29 during PBF.
Conclusion: The findings of the assessment of the effect of PBF scheme on maternal and child health services in the Mifi Health District, demonstrates a significant improvement in key indicators of maternal and child health, following PBF implementation. This study highlights the essential need for policymakers to carefully examine the effect of the PBF strategy on maternal and child health with the perspective of further scaling up this reform to other regions. Therefore, PBF can be an effective strategy for improving maternal and child health by increasing the utilisation of MCH services.

Keywords: Performance-based financing; maternal and child health services; Mifi.

1. INTRODUCTION

Although Performance-Based Financing (PBF) in low- and middle-income countries has been around for more than 10 years and despite some interesting studies and findings, we still know too little about the mechanisms that lead to the reported outcomes [1]. According to Witter et al. [2], the lack of robust studies is the main explanation for this gap. We argue that the problem already starts at the definition of the construct. In the literature there is an explicit and implicit overemphasis (apparent in the research designs) on the payments based on performance (defined as outputs verified for certain quality measures) as being the only element of PBF [3,4,5,6,7,8]. The health facilities in Cameroon are organized into seven main categories: general hospitals, central hospitals, regional hospitals, district hospitals, district medical centers, Integrated health centers and ambulatory health centers [9].

The main challenges faced by the Cameroon health system can be summarized into; a low quality of care, the difficult regulation of a growing private for-profit sector, the lack of qualified human resources, and the lack of accountability. Despite huge investments in the health sector by many funders, many health indicators in Cameroon remained substantially poorer than those of neighboring African counties, especially those concerning maternal and child health (MCH) [10]; We can hereby quote a high Maternal mortality ratio of 782 deaths per 100,000 live births, an under-five mortality rate of 79 deaths per 1,000 live births and a high Neonatal mortality rate of 28 deaths per 1,000 live births in 2018 [11]. There was therefore a need for an innovative approach that could improve the efficiency of health inputs in order to get back on track for the attaining the sustainable development goals (SDGs) related to MCH. An analysis of the health system of Cameroon revealed that linking performance to results could indeed make a difference; and led to the implementation of the Performance-based financing scheme [12].

Performance-based financing (PBF) is a health financing reform aimed at enhancing the quality and quantity of health care provision by paying health care providers and regulatory bodies based on their performance, as measured against predetermined targets, and formalizing this financing by a contract between the service provider and a purchaser. [13,14,15]. This narrow definition can be seen as an artefact of the early days of PBF when branding was important to distinguish it from 'competing' propositions. The first issue was to clear up the possible confusion between the contracting-in approach of PBF and the contracting-out approach of Performance-Based Contracting. Whereas the former is directed towards health service providers acting within the national health system as in Rwanda [16] the latter mainly focuses on non-state entities (not necessarily providers) outside the hierarchical structure of the national health system [17] as in Haiti [18] or Cambodia [19].

The intervention aims at increasing provider's accountability with regard to their mission and giving them the autonomy and financial incentives necessary to achieve their goals [20]. Other non-monetary incentives in the PBF

approach are also important such as improving transparent management through the introduction of business plans and financial management tools. The other characteristic of the PBF approach is the promotion of good governance through the separation of roles according to the main functions in health systems. These functions are: regulation, service provision, contract development and verification, payment and strengthening consumer influence [21].

An impact evaluation carried out between mid-2012 and mid-2015 across three of the regions implementing PBF in Cameroon (excluding Littoral) showed that PBF produced overall positive changes in service coverage for some indicators (e.g. maternal and child immunization, family planning and HIV testing), but not for others (e.g. antenatal care, assisted deliveries and child curative consultations [22]. The aim of the study was to determine PBF's effect on the trend of key maternal and child health indicators, by comparing the changes in the latter before and after PBF's inception given that although it seems to be a promising reform, no research has been carried out to investigate its effect on maternal and child health in Cameroon. Our research question was; does PBF's implementation have an effect on maternal and child health?

2. METHODS

2.1 Study Setting

The Mifi health District is a semi-urban district, partitioned into 20 health areas all of which are functional; it has a total of 130 health facilities. The PBF project was implemented in this health District in October 2018 during the scaling up process that entailed extending the PBF program to other regions of Cameroon, after it had been proven to be an effective strategy to improve health service delivery.

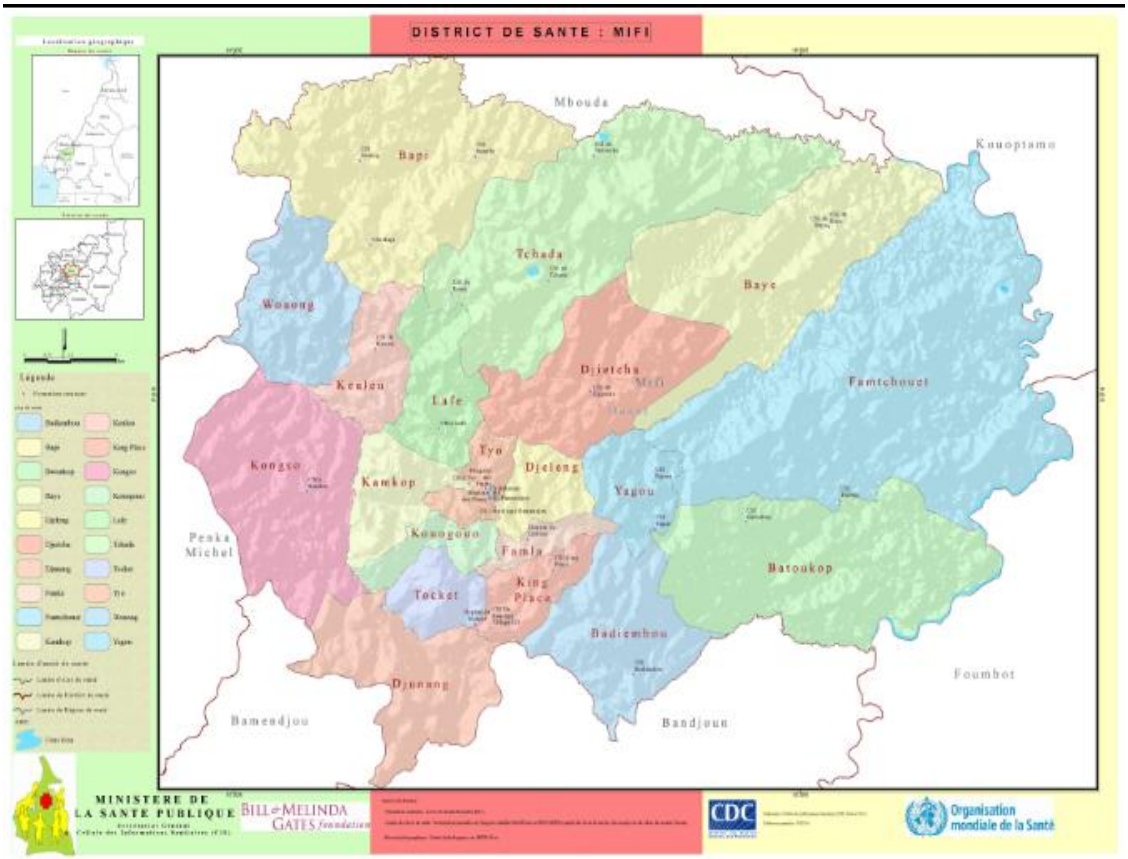

Fig. 1. Mifi health District map (MINSANTE)

The Mifi health district. source: health informations unit, ministry of public health, Yaounde, Cameroon. https://dhis-minsante-cm.org/portal/

2.2 Study Design

An analytical cross-sectional study was carried out in the Mifi Health District, to compare the trend in some key maternal and child health indicators before the implementation of PBF (i.e. from 2017-2018) and after its inception (i.e. from 2018-2019) across 41 randomly selected facilities.

Eligibility criteria

➢ **Inclusion criteria**

-Health facilities enrolled in the PBF project.
- Health facilities that had been running for at least 3 years

➢ **Exclusion criteria**

- Health facilities that reported missing data for more than 1 outcome or where registers for more than 2 years investigated were absent
- Health facilities who refused to take part in our study

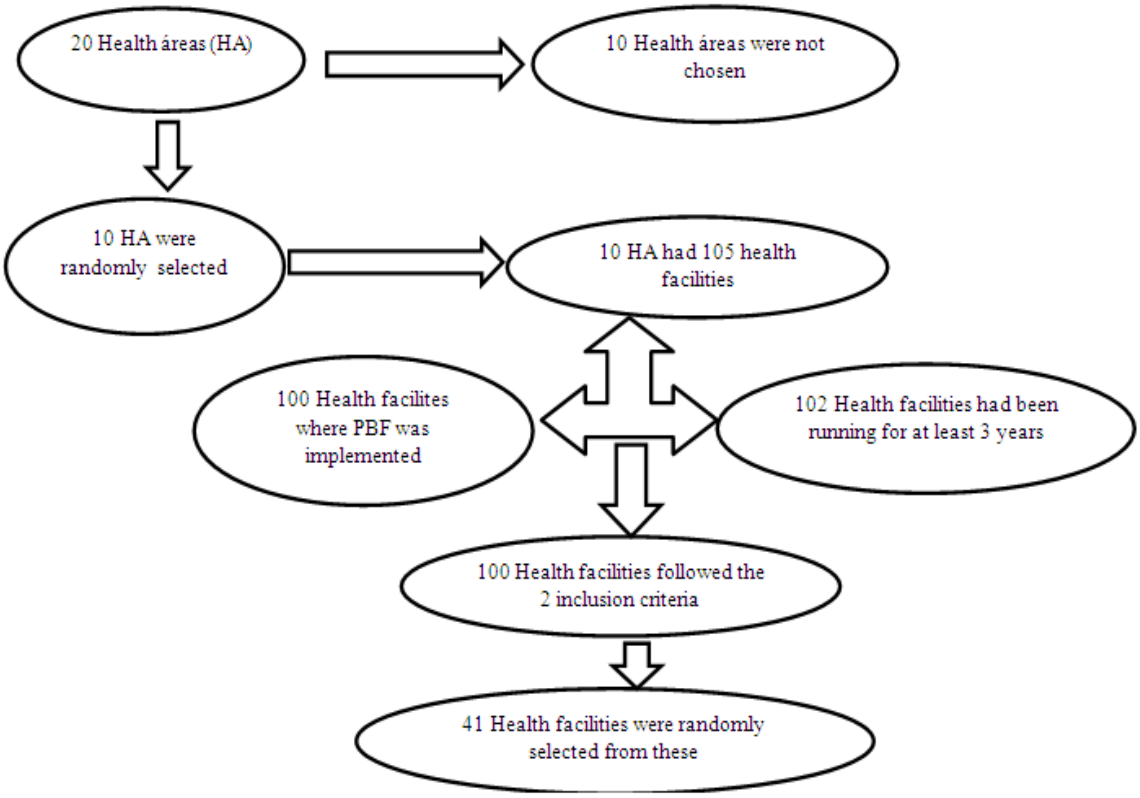

Fig. 2. Flow chart showing sample size selection

Table 1. Repartition of chosen health facilities according to health areas

N°	Health areas	Number of health facilities per health area	Estimated percentages	Selected health facilities
1	Badiembou	6	6%	2
2	Djeleng	15	15%	6
3	Djunang	3	3%	1
4	Famla	13	12%	5
5	Kamkop	13	12%	5
6	King place	13	12%	5
7	Kougouo	8	8%	3
8	Lafe	9	9%	4
9	Tyo	17	16%	7
10	Yagou	8	7%	3
	Total	105	100%	41

2.3 Indicators

Table 2. Definition of variables for a child

Objective	Indicator	Estimation of variable	Significance
Assess the BCG coverage, Pentavalent dropout rate, the number of children who received the 1st dose of measles rubella vaccine and the number of child deaths across chosen facilities before and after the inception of PBF	BCG coverage	-Number of children who received BCG /Number of children expected to come before PBF --Number of children who received BCG /Number of children expected to come after PBF	Confidence Interval at 95%
	Pentavalent dropout rate	Number of children who received Penta-3 –Number of children who received Penta 1 before PBF Number of children for received Penta-3 –Number of children who received Penta 1 after PBF	Confidence Interval at 95%
	Number of children who received the 1rst dose of measles and rubella vaccine (MR-1)	- Number of children who received MR-1 before PBF - Number of children who received MR after PBF	Confidence Interval at 95%
	Number of child deaths	-Number of child deaths before PBF - Number of child deaths after PBF	Confidence Interval at 95%

Table 3. Definition of variables for maternal indicator

Objective	Indicator	Estimation of variable	Significance
To determine the trend of key maternal indicators such as; antenatal care visits, institutional deliveries, postnatal care visits and maternal deaths from 2017 to 2019.	First ANC visit proportion	- Number of pregnant women who came for first ANC/Number of pregnant women who were expected to come before PBF - Number of pregnant women who came for first ANC/Number of pregnant women who were expected to come after PBF	Confidence Interval at 95%
	Number of women who came for at least 4 ANCs	-Number of women who came for at least 4 ANCs before PBF - Number of women who came for at least 4 ANCs after PBF	Confidence Interval at 95%
	Number of post natal visits	-Number of post natal visits before PBF - Number of post natal visits after PBF	Confidence Interval at 95%
	Number of maternal deaths	- Number of maternal deaths before PBF - Number of maternal deaths after PBF	Confidence Interval at 95%

2.4 Statistical Analysis

Data was analyzed with IBM SPSS version 23. A linear regression model was used to determine the strength of the relationship between key child health indicators and time implementing PBF. A paired sample t test was also used to verify if a significant difference existed in the mean of child indicators before and after the implementation of PBF across 41 selected facilities. Considering a p-value of <0.05 and a confidence interval at 95% was established

3. RESULTS AND DISCUSSION

3.1 Results

3. 1.1 Health district characteristics

Fourty-one (41) health facilities were included in the study. Table IV shows that the majority belonged to the 6th category of health facilities according to the Cameroon health system (87.80%) and most of them were private (58.54%). The numbers of qualified staff were 2.21 per thousand which is not very far from the WHO proportion of 2.23 per thousand of the

population [22] this implies that remarkable progress has been made.

3.2 Trend of key Indicators

3.2.1 Child health indicators

Fig. 3 shows a steady rise in the mean BCG coverage per year per health facilities from 2017 (57.92%) to 2018 (138.59%) which dropped to 134.97% in 2019 and this difference was significant (p=0.022) over the years. There was a significant decrease (p=0.001) in the Pentavalent dropout rate from 83.68 in 2017 to a negative slope in 2018 and 2019. There was no significant difference in the mean number per year per health facilities of children who received the first dose of Measles and Rubella vaccine (MR-1) across the three years. (p=0.416), finally a significant drop in the mean number of child deaths per health facilities per year was observed (p-value =0.01) from 6.3 in 2017 to 1.5 per hundreds in 2019.

3.2.2 Maternal health indicators

Fig. 4 indicates that there was a significant rise in the mean proportion of women (per year per facility), who came for first ANC from 58.59% in 2017 to 229.77% in 2019 (P value = 0.021). The mean number per year per health facilities of pregnant women who came for at least four ANCs in 2017, 2018 and 2019 were 18.46, 70 and 119.05 respectively, in 2018, the number doubled and in 2019, the number was more than four times what was observed in 2017. This difference was significant across the years for this outcome (p-value =0.05). Regarding institutional deliveries, there was no significant difference in the mean number of deliveries per year per health facilities from 2017 to 2019 (p-value=0.90), despite the fact that it increased from 81.49 in 2017 to 174.59 in 2019. There was a significant increase in the mean number of postnatal care visits per year per health facilities (p=0.017) from 9.34 in 2017 to 75.29 in 2019, finally a stagnant mean in number of maternal deaths per year per health facilities was observed from 2017 to 2018 (1), it later rose up to 2.9 in 2019 although this difference wasn't significant. (P-value =0.136)

3.3 Effect of PBF's Implementation

3.3.1 Child indicators before and during PBF

Table V shows that there was a significant decrease in the mean Pentavalent dropout rate per year per health facilities (p-value=0.02) from 26.61 before to -104.07 during PBF as well as in the mean number of child deaths per year per health facilities (p-value=0.019) which diminished from 0.46 before PBF to 0.15 during PBF.

3.3.2 Maternal indicators before and during PBF

The results in Table VI shows that there was a significant increase in the mean proportion per year per health facilities of women who came for first ANC (p=0.001) from 94.55 to 229.71. The mean number per year per health facilities of pregnant women who came for at least 4 ANCs (p=0.034) also increased significantly from 44.65 to 119.05, the mean number per year per health

Table 4. Characteristics of study health facilities

HF Category	
Category	**Statistics n (%)**
4th i.e. District hospitals	1 (2.44 %)
5th i.e. Sub-divisional centres	4 (9.76 %)
6th i.e. Integrated health ,clinics ,health centres ,medical cabinets	36 (87.80 %)
Status	
Status	**Statistics n (%)**
Confessional	6 (14.63)
Private	24 (58.54)
Public	11 (26.83)
Health work force and service utilization	
Health work force and service utilization	**Mean (standard deviation)**
Population	8623 (11931.90)
Beds	19.48 (20.89)
Qualified health personnel	???
Beds to population ratio	2.68 (1.93) per 1000
Health personnel to population ratio	2.21(2.96) per 2000

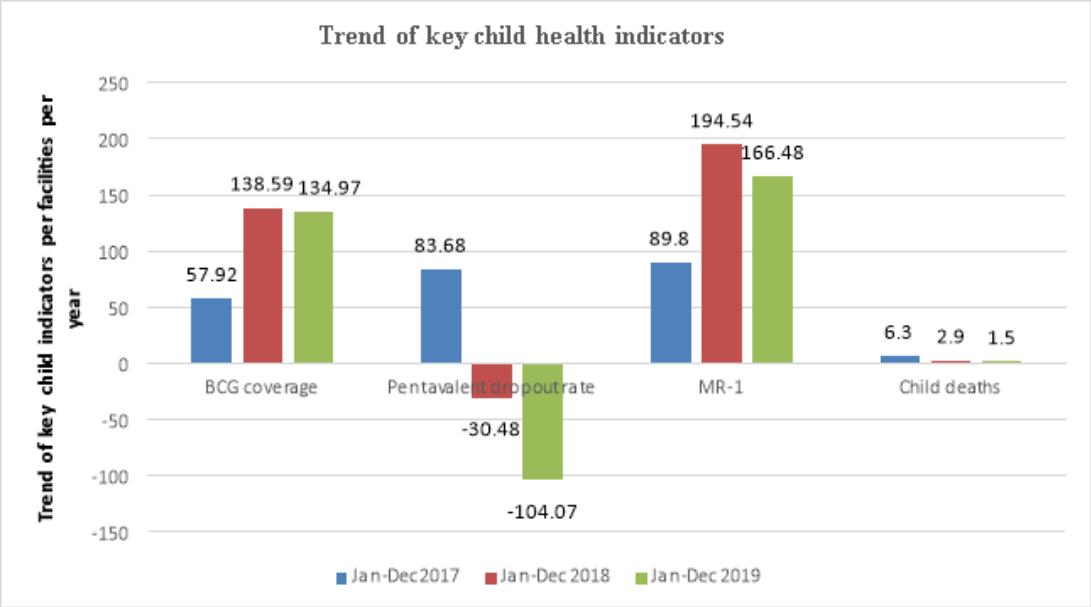

Fig. 3. Trend of key child indicators

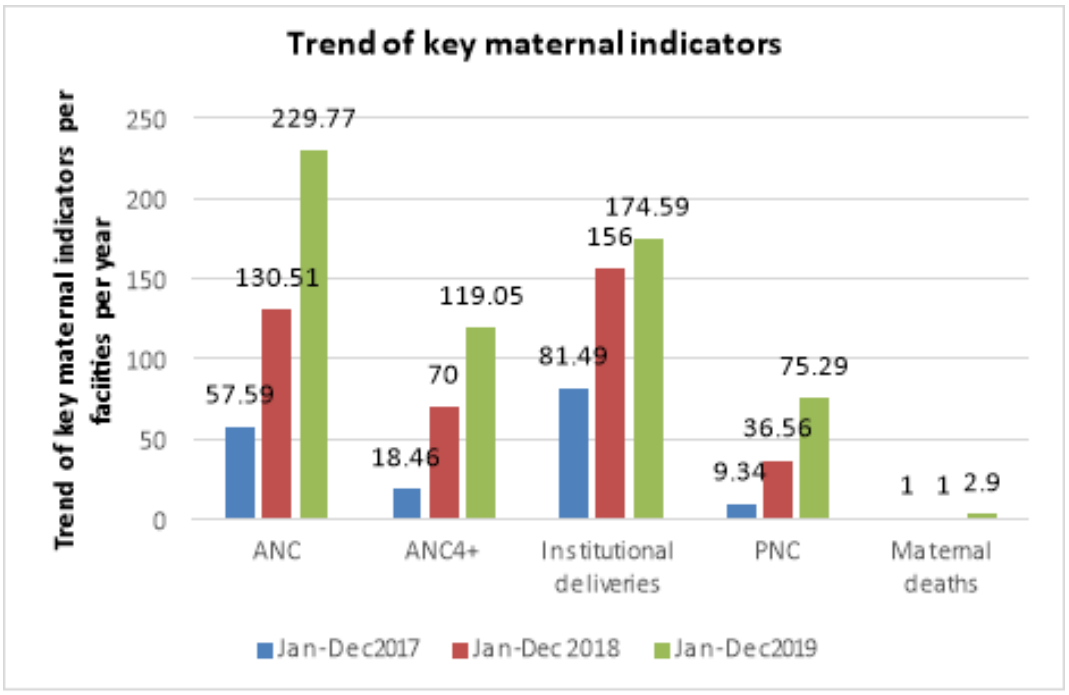

Fig. 4. Trend of key maternal indicators

Table 5. Child indicators before and during PBF

Indicator (per year per health facility)	Mean ±Standard Deviation		t	P
	Before PBF	**During PBF**		
%BCG coverage	98.26±149.061	134.97±159.838	-1.228	0.223
Pentavalent-dropout rate	26.61±245.895	-104.07±205.446	-3.109	0.002
MR-1	144.23±467.755	166.48±311.323	-0.310	0.757
Child deaths	0.46±0.791	0.15±0.358	2.388	0.019

Table 6. Maternal indicators before and during PBF

Indicator (per year per health facilities)	Mean± Standard Deviation		T	P
	Before PBF	During PBF		
% first ANC	94.55±119.462	229.71±307.778	-3.496	0.001
number of ANC4+	44.65±119.593	119.05±264.813	-2.140	0.034
Number of HIV tested	90.93±198.169	210.49±396.461	-2.225	0.028
number ATT	83.00±176.976	148.46±261.222	-1.445	0.154
Number of Institutional deliveries	119.04±217.879	174.59±302.209	-1.047	0.229
Number PNC	23.23±51.263	75.29±164.290	-2.620	0.010
Number of maternal deaths	0.10±0.374	0.29±0.873	-1.716	0.089

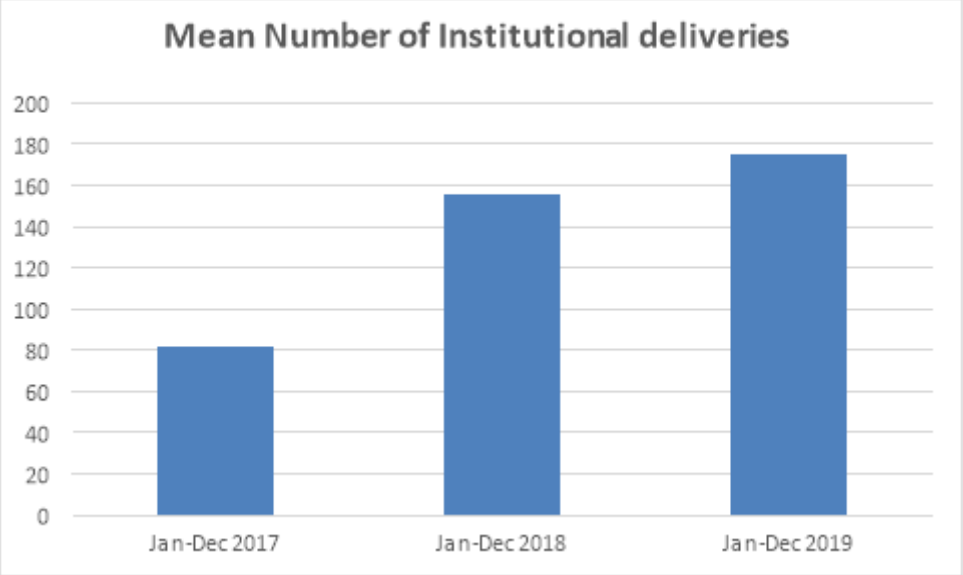

Fig. 5. Mean Number of Institutional deliveries

facilities of pregnant women HIV tested increased significantly as well (p=0.028) from 90.93 to 210.49 same as the number per year per health facilities of women who came for post natal visits which significantly increased (p=0.010) from 23.23 to 75.29 during PBF.

3.3.3 Institutional deliveries

The results show that there was no significant difference in the mean number per year per health facilities of institutional deliveries from 2017 to 2019 (p-value=0.90), despite the fact that it increased from 81.49 in 2017 to 174.59 in 2019.

3.4 Discussion

The study was carried out specifically to determine the trend of key maternal indicators such as; proportion of women who came for first ANC visits, pregnant women who came for at least 4 ANC visits, postnatal care visits and also maternal deaths across chosen facilities from 2017 to 2019. Determine the trend of key child indicators such as; BCG coverage, Pentavalent dropout rate, children who received the 1st dose of measles rubella vaccine and child deaths across chosen facilities from 2017 to 2019 to compare MCH indicators before and after PBF's implementation.

1. Trend of key maternal indicators before and after PBF

There was a significant increase in the proportion of women who came for first ANC (p=0.001) per year per health facilities from 94.55 to 229.71. The mean number of pregnant women who came for at least 4 ANCs (p=0.034) also increased significantly from 44.65 to 119.05, the mean number per year per health facilities of pregnant women HIV tested increased significantly as well (p=0.028) from 90.93 to 210.49 same as the number of women per year per health facilities who came for post natal visits which significantly increased (p=0.010) from

90.93 to 210.49 during PBF. These results although not all robust, fall in line with the results obtained from a similar research carried out in Burkina fasso where a considerable increase was noted for the previously mentioned outcomes after the implementation of PBF although contrarily to our study the increase in the proportion of women coming for first ANC wasn't significant. The results showed that the average number of advanced ANC visits, deliveries and postnatal care visits increased by 27.7%, 9.2%, and 119%, respectively. This study shows that in the context of user fee reductions, additional strategies that focus on reinforcing the delivery of essential health services, such as performance-based financing, might be a successful policy tool to further increase coverage by increasing health worker motivation while ensuring quality of care (4) This also goes in line with another research carried out in Mozambique [23] to evaluate the effect of a performance-based financing program on HIV and maternal/child health services which found out that more women completed four antenatal care (ANC) visits in PBF facilities: in the North, on average, a health facility with PBF saw 176.8 (11.6, P<0.001) more women per quarter completing four ANCs than control facilities, translating into 14851 women per quarter in the province or a 153% increase over baseline. Similarly, from the same study, a health facility with PBF in the South saw an average of 88.6 (15.1, P<0.001) more women completing 4 ANCs per quarter than control facilities, translating into 7442 women per quarter in the province or an 82.4% increase over baseline. The results of this study show that, in the context of this program, PBF could result in sustained and large increases in health service outputs particularly for MCH.(19) A two-wave pooled cross-sectional analysis to bring out the effect of performance-based financing on maternal healthcare use in Burundi [11] found no effect of PBF on ANC (Any ANC visit beta(0.044) SE (0.031) (p=0.1575) Three or more ANC visits beta(0.128) SE (0.104) (p=0.223) they concluded that the non-increase in ANC use may be caused by the fact that use of antenatal services during pregnancy are more related to cultural and behavioural aspects (e.g. low knowledge about the importance of antenatal consultations) and could be better addressed by interventions focused at community level [11].

There was an increase in the mean number of maternal deaths per year per facility from 0.10 in 2017 to 0.29 in 2019 although it wasn't significant (p=0.089), this can be explained by an improved reporting which came with PBF, this can also be due to the inability of certain health facilities to take care of complicated deliveries and a delay in the referral system. Financial difficulties can also be a hindrance to accessing maternal care which can finally lead to maternal deaths.

2. Trend of key Child indicators before and after PBF

There was an increase in the mean BCG coverage per year per facility from 98.26 to 134.94 although it wasn't significant (P<0.223).There was also a significant decrease in the mean Pentavalent dropout rate per year per health facilities (p-value=0.02) from 98.26 to 134.97 during PBF thus revealing that more children came for the 3rd Pentavalent dose than for the 1st. Our results contradicts a study carried out in Burundi which used quite a different approach and a different data set to evaluate the effect of PBF on primary health care services, and found no sound statistically significant difference for the aforementioned indicators between the periods pre and post introduction of PBF [24]. This increase in the number of children coming for Penta-3 can be explained by the fact that CHW referred a good number of children to health facilities for vaccination, it could also have been due to an afflux of IDPs (Internally displaced people coming from the Anglophone zones although this theory can easily be disproven since most IDPs don't have access to HF due to financial and other difficulties.

There was no significant difference in the mean number per year per health facilities of children who received the first dose of MR across the three years (p-value= 0.757). Our findings are consistent with PBF evaluation in other countries such as a study ; carried out in Nigeria to determine the uptake of Maternal and Child Health Services whereby the percentage of target children receiving measles immunization for was higher in the intervention area than the control area (12.7% vs. 5.1%, respectively), the differences (were not statistically significant (chi-square = 3.27; p=0.659) although after investigation it appeared that this was due to stock-outs and a relatively long distance of households from intervention facilities [25]. And another in Mali testing the effects of pilot performance-based -intervention implementation and withdrawal on the coverage of maternal and child health services where the trend was downward and relatively stable in intervention

and control group (trend difference ¼ 0.01, P>0.45) but not statistically significant [2]. This could be due to the unavailability of 2017 registers on this indicator, which deprived us of information which could have made a difference.

Finally a significant drop in the mean number per year per health facilities of child deaths was observed (p-value =0.019). Despite the fact that child mortality is a measure of impact and that not only one factor can account for its significant decrease over the years, PBFs modest contribution could have been by encouraging HF to recruit more qualified staff that handled to a greater extent complicated deliveries, training CHW to refer more children to HFs to be vaccinated, as well as encouraging their mothers to go for early ANCs and follow them till the end which obviously should have had an impact on the child's health and his chances of survival .

4. CONCLUSION

This was a cross-sectional study carried out in the Mifi Health District to compare the trend of key maternal and child indicators before and after the inception of PBF. There was a significant increase in maternal indicators such as; mean proportion per year per health facility of pregnant women coming for first ANC, the mean number of pregnant women per year per facility who came for more than 4 ANCs and the mean number per year per health facility of women coming for post natal visits. There was a significant decrease in the mean Pentavalent dropout rate and in the mean number per year per facility of child deaths.Overall maternal and child indicators increased significantly when comparing the period before PBF's implementation and the period after its inception. Therefore, PBF can be an effective strategy for improving maternal and child health by increasing the utilisation of MCH services.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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