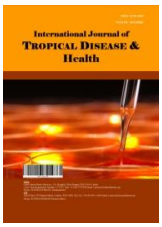

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Effect of Performance-based Financing on the Coverage of Antenatal Care and Immunization Services in Buea Health District, Cameroon

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Authors' contributions

This work was carried out in collaboration between both authors. Author BE conceived the study, wrote the protocol and performed the statistical analysis and wrote the first draft of the manuscript. Authors BE and FM designed the study and managed the literature searches. Author FM contributed materials for the study and proofread the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction and Aim: Financing healthcare is a major factor in our society today which affects access to quality healthcare. The MDGs reached their deadline in 2015 but progress has been insufficient with reducing the morbidity and mortality rates of diseases. The healthcare system of Cameroon is characterized by low coverage for preventive care services. Innovative ways must be identified to fast track the coverage of MCH services. Lack of incentives affects the coverage of ANC and immunization services. The aim of this study was to assess the effect of PBF on the coverage of ANC and immunization services.

Methods: An experimental study design was used and health facilities in the Buea Health District were randomly selected and assigned to one of four groups, three intervention groups (T1, C1 and C2) and one control group (C3). Using multistage sampling, a total of 434 postpartum mothers and 474 children participated in the study. An interviewer administered questionnaire was used and data was analyzed using EPI Info version 3.5.4 and STATA version 10.1 statistical software.

Results: The mean age of the 434 postpartum mothers was 26.03. Supervision alone had significant effect on the four or more ANC visits (p=0.04). Both financing and supervision had

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statistically significant effect on the four or more ANC visits (p=0.003) and immunization. Financing and fixed per capita budgetary supplement did not have a significant effect on the coverage of ANC and immunization services.

Conclusion: Both Financing and enforced supervision is necessary in order to improve the coverage of ANC and immunization services thus accelerating progress towards improving MCH.

Keywords: Performance; financing; coverage; antenatal care; immunization; MDG; MCH.

1. INTRODUCTION

Improving the performance of healthcare delivery systems is an important objective, both in high-income settings and, especially in low- and middle-income countries, where resources for health are much more constrained [1]. Two of the United Nations (UNs) Millennium Development Goals (MDGs) that were developed in the year 2000 were to reduce the child mortality (Reduce by two thirds the mortality of children under five) and thus, to improve the maternal health (Reduce maternal mortality by three quarters and Achieve universal access to reproductive health). The UN MDGs have passed their deadline of 2015 but progress to date has been insufficient [2]. In 2005, total health expenditure in Cameroon represented just 5.2 % of the Gross Domestic Product (GDP). The 2006 Ministry of Public Health's (MOPH) budget was 4.5% of the state budget, far below the 15 % recommended by the Heads of States Conference in Abuja in 2000 [3]. Evidence about the best methods with which to accelerate progress towards achieving the MDGs is urgently needed [4]. Today, the health status of Cameroonians is still very poor with infant mortality rate (2011) at 79/1000 live births and maternal mortality ratio (2010) at 690/100.000 live births with life expectancy at birth being 52 years old [5]. Public expenditure on health has increased over the past few years in most low-income countries but results have been slow. As the public health system remains the backbone of national health policy and the main beneficiary of international aid, it is most likely to be part of the problem [2].

The health system of Cameroon is fraught with a certain number of difficulties linked to health care delivery. These include: underuse of health centers and services for curative and promotional care; low coverage for preventive care; insufficient continuous care (referrals) and usually of poor quality; high staff absences and acute shortages in hard to reach areas; and inequitable health services distribution with limited access to health care by the poor and vulnerable and the hard to reach [6]. Despite these numerous problems plaguing the healthcare system very few proposals for reform have been put forward [2]. In too many countries, the public health system does not meet user needs and demands. It is inefficient due to lack of resources and worker absenteeism [2]. Equity, in terms of utilization and contribution, is unsatisfactory and public spending often benefits richer groups disproportionately [7]. Ministries of health and their international advocates often cite insufficient funding as the underlying cause of low performance Maternal and Child Health services (MCH). Others argue that it also stems from a lack of accountability within public health systems [2]. An intervention that shows promise for improving access and quality of such health services is performance-based payment of health-care providers [8], which has been under discussion throughout the history of work contracts [9].

Performance-based financing (PBF) is currently receiving increased attention as a strategy for improving the performance of healthcare providers, organizations, and governments. It is also promoted as an important tool for achieving the Health-Related Millennium Development Goals, improving the effectiveness of development aid, and motivating patients to improve their attendance at health facilities and compliance with recommended health interventions [1]. The basic principle is "the money follows the patient", if health facilities attract more patients and provide quality services they will receive more subsidies and incentive payments on a scheduled basis (monthly, quarterly or bi-annually) [10]. Human resources are a critical component of any health system and the driving force of its performance [11]. PBF is based on a powerful assumption that individuals and organizations are motivated to perform better by incentives [12]. It is an innovative, results-oriented, and practical approach that ties payments to staff or beneficiaries based on their achievement of agreed-upon, measurable performance targets [2, 13].

PBF, or 'pay-4-performance' or 'output based aid' as it is generally referred to, consists of a family of various methods and approaches that all aim, through differing levels of intervention, at linking incentives to performance [14]. PBF requires verifiable indicators and provides incentives for meeting or exceeding the expected results [13]. PBF is increasingly being applied in a variety of contexts, with the expectation that it can improve the performance of health systems with growing literature on implementation issues and effects on outputs [12]. PBF is steadily replacing the input based centralized systems which have produced disappointing results during the last few decades [15]. Several studies have shown that PBF has encouraging results compared to more traditional systems concerning not only maternal and child health services outputs but also concerning efficiency, quality and equity [15–17].

The PBF initiative in Cameroon aims to increase health care provision. It addresses the second strategic axes of the health strategic development plan concerning issues related to quality health care delivery at the operational level (health centers and district hospitals) of the health pyramid [6]. PBF schemes have been shown to increase skilled delivery in India, increased the outputs of non-governmental organizations in health in Haiti, and increased immunization coverage [18]. PBF can increase the utilization of MCH services and thus accelerate progress towards the realization of the MDGs for MCH [19]. The introduction of PBF in Burundi has led to significant increases in mother and childcare utilization and in the quality scores of health-care facilities [20]. There is now evidence that performance bonuses to providers based on volume and quality of services provided has had significant impact on a range of services which include the coverage of prenatal care, and even more so on preventive care for children [21].

2. MATERIALS AND METHODS

2.1 Study Design and Setting

An experimental study design (Randomized Controlled Trial) was used for this study. Health facilities were randomly assigned to either of the four arms: T1, C1, C2 and C3 to ensure that there were no systematic differences between them with the exception of the district hospitals and assimilated hospitals of the same technical level which receive the full PBF package because they are important supervisory and referral centres. This randomization was done by the Performance Purchasing Agency (PPA) for the South West Region. The T1, C1 and C2 groups (the intervention groups) had different levels of the PBF intervention while the C3 group (the control group) did not have any intervention at all. Data on different health outcomes had been collected from these different health facilities since June 2012 with no impact evaluation carried out yet.

The study groups: T1 were the experiment facilities that were implementing the full package of PBF which includes incentivized payments, additional financial resources, reinforced supervision and increased managerial autonomy. C1 were the intervention facilities that received fixed per capita budgetary supplement that matches the per capita budgetary allocation for T1 facilities and is not linked to performance but to the size of the catchment area in order to ensure budget neutrality. C2 were the intervention facilities that received no additional resources unlike their counterpart facilities, T1 and C1, but receive the same amount of supervision and monitoring that T1 and C1 received. C3 were the control facilities that operated according to the status quo and they received neither performance payments nor systematic supervision but operated as they have always operated.

The study area was Buea Health District of the South West Region, Cameroon. It is one of the 4 health districts in South West Region in which PBF is being implemented. The Buea Health District is the major area in which PBF is being implemented and is representative of all the other health districts in the South West Region. The Buea Health District has a total population of about 133,089 inhabitants (2011 est.), 7 health areas and 23 health facilities. Healthcare facilities in this district consist of a mix of public, for-profit and faith based facilities. Public facilities have the highest frequency followed by for-profit facilities and para-public facilities and then faith based facilities.

2.2 Study Population

The study population included postpartum mothers who delivered in selected health facilities or had been referred from any selected health facility to another during labour but had their ANC visits in any of the selected health facilities. The study also included children who had started IWC and who were supposed to

receive their Penta-3, measles and Vitamin A vaccines in any of the selected health facilities.

2.3 Sampling Technique and Sample Size

A multistage sampling was used where by health facilities in the Buea Health District were first randomly selected and assigned to one of four groups. Three facilities were randomly selected from each of the study groups. Participants in each participating health facility were randomly selected from each of the study groups which resulted in 102 participants selected in each of the study groups. The total sample size was 434 postpartum mothers (112 in T1, 110 in C1, 107 in C2 and 105 in C3) and 474 children (124 in T1, 120 in C1, 116 in C2 and 114 in C3). The following formula was used to estimate the sample size for comparing two proportions:

$$N = 2.\frac{\left[Z_{crit}\sqrt{2\bar{p}(1-\bar{p})} + Z_{pwr}\sqrt{p_1(1-p_1)+p_2(1-p_2)}\ \right]^2}{D^2}$$

Where: p_1 and p_2 are pre-study estimates of the two proportions to be compared, D=|p_1- p_2| and is the minimum expected difference, $\bar{p}$ = (p_1+p_2)/2, N is the total sample size (sum of the sizes of both comparison groups), Z_{crit} is the desired significance criterion and Z_{pwr} is the desired statistical power. The values used for the calculation include a statistical power of 0.80, Z_{pwr} = 0.842 and Significance criterion of 0.05, Z_{crit} = 1.960. p_2 is the proportion of at least 4 ANC visits in PBF facilities = 50% and it is hoped that PBF will increase the coverage by 20%, therefore p_1=30%, $\bar{p}$= 0.4 and D=0.2. N will be 186, 93 for the intervention and 93 for the control arm

2.4 Study Procedure

After the sorting of study participants, informed consent was obtained and a structured questionnaire was interviewer administered to postpartum mothers (after delivery or during IWC) who consented to be part of the study. IWC registers were used to collect information on the vaccination status of the children. IWC registers were also used to collect information on the vaccination status of the children. For postpartum mothers under 21 years, guardian consent was gotten from their parents and assent gotten from the postpartum mothers. Women who were referred during labour to a new facility were also followed up on information about their ANC visits in the previous facility. For pregnant women, information about their socio-demographic characteristics, ANC visits and other care was collected on the questionnaires which were coded. For the children, information about their socio-demographic characteristics as well as their immunization status for Penta-3 (DPT-Hep B+Hib-3) and measles vaccines were also collected on well-designed forms which were also be coded.

2.5 Data Management and Analysis

Data collected from postpartum mothers using the questionnaires was organized and analyzed using both STATA version 10.1 software and EPI Info version 3.5.4. Data was analyzed by comparing the difference in the outcomes between the intervention and control groups. Participant characteristics as well as parameters of coverage of ANC and immunization services were described using means, medians, standard deviations and interquartile ranges (IQRs) for continuous variables, and using absolute and relative frequencies of various responses for categorical variables.

For the effect of financing on ANC and immunization coverage, outcomes in T1 were compared with outcomes in C2. For the effect of Supervision on ANC and immunization coverage, outcomes in C2 were compared with outcomes in C3. For the effect of financing and supervision on ANC and immunization coverage, outcomes in T1 were compared with outcomes in C3. For the effect of fixed per capita budgetary supplement on ANC and immunization coverage, outcomes in C1 were compared with outcomes in C2.

For the coverage of ANC, a chi-square test (bivariate analysis) comparing the proportion of women who had at least four ANC visits and proportion of those who had their first ANC visit in the first trimester of the intervention group to the control groups was computed for odds ratios and p-values. P-values < 0.05 was accepted as statistically significant. A Mann-Whitney U test (bivariate analysis) for comparing the median number of ANC visits the women had prior to delivery in the intervention and control groups were computed for p-values.

For the coverage of immunization, a chi-square test (bivariate analysis) comparing the proportion of children who had received their penta-3(DPT-Hep B+Hib-3), and measles vaccines in the intervention group compared to the control groups were computed for odds ratios and p-values.

For binary variables like first ANC visit in first trimester and four or more ANC visits, a multivariate analysis (multivariate logistic regression) was conducted to compute for adjusted odds ratios adjusting for confounding variables like age, level of education and others in a regression model. Only predictor variables that had a p-value < 0.2 in the bivariate analysis were used for the multivariate analysis.

3. RESULTS AND DISCUSSION

3.1 Results

The mean age of the 434 postpartum mothers was 26.03 with a standard deviation of 5.03. More than half of the respondents that is 120 (27.6%) and 152 (35.0%) ended school at primary and secondary level respectively. All the postpartum mothers were either married or single with 302 (69.6%) of them married (more than 50%). Among the 434 respondents, the median number of previous pregnancies of the postpartum mothers was 2 (interquartile range-IQR: 1- 3) (Table 1).

Among the 474 children, 242 (51.1%) of them were females and 232 (48.9%) were males.

3.1.1 Effect of financing

Among the 112 postpartum mothers in T1, 87 (77.7%) had four or more ANC visits when compared to 74 (69.2%) in the 107 postpartum mothers in C2. Postpartum mothers in T1 were 1.55 times as likely to have four or more ANC visits when compared to postpartum mothers in C2 (OR=1.55, 95% CI: 0.85, 2.84). The difference in the outcome was not statistically significant (chi-square=2.04, p= 0.15). This difference might have been due to chance (Table 3).

Table 1. Socio-demographic characteristics of postpartum mothers

Variable	Total population	T1	C1	C2	C3	P-value
Age Mean (SD)	26.03 (5.03)	26.28 (4.99)	26.89 (4.40)	25.25 (5.41)	25.67 (5.21)	0.0855
Highest Level of Education						0.0000
Primary N (%)	120 (27.6)	26 (23.2)	19 (17.3)	37 (34.6)	38 (36.2)	
Secondary N (%)	152 (35.0)	34 (30.4)	30 (27.3)	44 (41.1)	44 (41.9)	
High N (%)	83 (19.1)	26 (23.2)	25 (22.7)	19 (17.8)	13 (12.4)	
University N (%)	79 (18.2)	26 (23.2)	36 (32.7)	7 (6.5)	10 (9.5)	
Marital Status						
Single N (%)	132 (30.4)	31 (27.7)	31 (28.2)	39 (36.4)	31 (29.5)	0.4689
Married N (%)	302 (69.6)	81 (72.3)	79 (71.8)	68 (63.6)	74 (70.5)	
Previous pregnancies Median (IQR)	2 (1-3)	2 (1-3)	2 (1-3)	2 (1-3)	2 (1-3)	0.1186

Table 2. Socio-demographic characteristics of the children

Variable	Total population	T1	C1	C2	C3	P-value
Sex						0.4978
Female N (%)	242 (51.1)	66 (53.2)	54 (45.0)	61 (52.6)	61 (53.5)	
Male N (%)	232 (48.9)	58 (46.8)	66 (55.0)	55 (47.4)	53 (46.5)	

Table 3. Effect of financing on bivariate analysis for postpartum mothers

Variable	Four or more ANC visits			First visit in first trimester		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C2	REF			REF		
T1	1.55	0.85, 2.84	0.15	0.94	0.53, 1.65	0.82

Of the 112 postpartum mothers in T1, 31.3% had their first ANC visit in the first trimester of pregnancy when compared to 32.7% in the 107 postpartum mothers in C2. Postpartum mothers in T1 were 0.94 times as likely to have their first ANC visit in the first trimester when compared to postpartum mothers in C2 (OR=0.94, 95% CI: 0.53, 1.65). The difference in the outcome was not statistically significant (chi-square=0.05, p= 0.82) (Table 3). This difference might have been due to chance.

The median number of ANC visits before delivery for postpartum mothers in T1 was 4 visits (IQR: 4 - 6) while the median number of ANC visits before delivery for postpartum mothers in C2 was 4 visits (IQR: 3 – 5). The medians were not statistically significantly different from each other (Mann Whitney U test p-value=0.09). The difference might have been due to chance.

Of the 124 children in T1, 109 (87.9%) had Penta-3 vaccination during IWC when compared to 89 (76.7%) in the 116 children in C2. Children in T1 were 2.20 times as likely to have received Penta-3 vaccine when compared to children in C2 (OR=2.20, 95% CI: 1.11, 4.4) (Table 4). The difference in the outcome was statistically significant (chi-square=5.19, p= 0.02).

Of the 124 children in T1, 61.3% had Measles vaccination during IWC when compared to 63.8% in the 116 children in C2. Children in T1 were 0.9 times as likely to have received Measles vaccine when compared to children in C2 (OR=0.9, 95% CI: 0.53, 1.52). The difference in the outcome was not statistically significant (chi-square=0.16, p= 0.69) (Table 4). The difference might have been due to chance.

The odds ratio of having four or more visits comparing postpartum mothers in T1 to C2 adjusting for age, highest level of education and number of previous pregnancies was 1.52 (95% CI: 0.80, 2.87, p=0.20) (Table 5). This was not statistically significant.

Table 4. Effect of financing on bivariate analysis for children

Variable	Penta-3 vaccination			Measles vaccination		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C2	REF			REF		
T1	2.20	1.11, 4.40	0.02	0.90	0.53, 1.52	0.69

Table 5. Effect of financing on multivariate analysis for postpartum mothers

Variables	Four or more ANC visits			First visit in first trimester		
	Adjusted OR	95% CI	P-value	Adjusted OR	95% CI	P-value
Study group						
C2	REF			REF		
T1	1.52	0.80, 2.87	0.200	0.84	0.46, 1.54	0.570
Age	0.96	0.88, 1.04	0.274	0.97	0.89, 1.05	0.394
Level of education						
Primary	REF			REF		
Secondary	1.90	0.88, 4.10	0.102	1.20	0.56, 2.58	0.646
High	1.68	0.68, 4.18	0.260	1.19	0.48, 2.94	0.708
University	1.97	0.66, 5.90	0.227	2.32	0.84, 6.41	0.106
Previous pregnancies	1.08	0.78, 1.47	0.652	0.92	0.67, 1.28	0.633

The odds ratio of having first ANC visit in first trimester comparing postpartum mothers in T1 to C2 adjusting for age, highest level of education and number of previous pregnancies was 0.84 (95% CI: 0.46, 1.54, p=0.57) (Table 5). This was not statistically significant.

3.1.2 Effect of supervision

Among the 107 postpartum mothers in C2, 69.2% had four or more ANC visits when compared to 55.2% in the 105 postpartum mothers in C3. Postpartum mothers in C2 were 1.82 times as likely to have four or more ANC visits when compared to postpartum mothers in C3 (OR=1.82, 95% CI: 1.04, 3.19) (Table 6). The difference in the outcome was statistically significant (chi-square=4.37, p= 0.04).

Among the 107 postpartum mothers in C2, 32.7% had their first ANC visit in the first trimester of pregnancy when compared to 25.7% in the 105 postpartum mothers in C3. Postpartum mothers in C2 were 1.40 times as likely to have their first ANC visit in the first trimester when compared to postpartum mothers in C3 (OR=1.40, 95% CI: 0.77, 2.55) (Table 6). The difference in the outcome was not statistically significant (chi-square=1.25, p=0.26). This difference might have been due to chance.

The average number of ANC visits before delivery for postpartum mothers in C3 was 4 times (IQR: 3-5) while the median number of ANC visits before delivery for postpartum mothers in C2 was 4 (IQR: 3-5.) The medians were statistically significantly different from each other (Mann Whitney U test p-value=0.01).

Among the 116 children in C2, 77.7% had Penta-3 vaccination during IWC when compared to 56.1% in the 114 children in C3. Children in C2 were 2.58 times as likely to have received Penta-3 vaccine when compared to children in C3 (OR=2.58, 95% CI: 1.46, 4.54) (Table 7). The difference in the outcome was statistically significant (chi-square=10.94, p= 0.0009).

Among the 116 children in C2, 63.8% had Measles vaccination during IWC when compared to 24.6% in the 114 children in C3. Children in C2 were 5.41 times as likely to have received Measles vaccine when compared to children in C3 (OR=5.41, 95% CI: 3.06, 9.57) (Table 7). The difference in the outcome was statistically significant (chi-square=35.86, p= 0.00000).

The odds ratio of having four or more visits comparing postpartum mothers in C2 to C3 adjusting for age, highest level of education and number of previous pregnancies was 1.88 (95% CI: 1.06, 3.34, p=0.03) (Table 8). This was statistically significant.

The odds ratio of having first ANC visit in first trimester comparing postpartum mothers in C2 to C3 adjusting for age, highest level of education and number of previous pregnancies was 1.40 (95% CI: 0.76, 2.57, p=0.28) (Table 8). This was not statistically significant.

3.1.3 Effect of both supervision and financing

Among the 112 postpartum mothers in T1, 77.7% had four or more ANC visits when compared to 55.2% in the 105 postpartum mothers in C3. Postpartum mothers in T1 were 2.82 times as likely to have four or more ANC visits when compared to postpartum mothers in C3 (OR=2.82, 95% CI: 1.57, 5.08) (Table 9). The difference in the outcome was statistically significant (chi-square=12.31, p= 0.0005).

Table 6. Effect of supervision on bivariate analysis for postpartum mothers

Variable	Four or more ANC visits			First visit in first trimester		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C3	REF			REF		
C2	1.82	1.04, 3.19	0.04	1.40	0.77, 2.55	0.26

Table 7. Effect of supervision on bivariate analysis for children

Variable	Penta-3 vaccination			Measles vaccination		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C3	REF			REF		
C2	2.58	1.46, 4.54	0.0009	5.41	3.06, 9.57	0.00000

Table 8. Effect of supervision on multivariate analysis for postpartum mothers

Variables	Four or more ANC visits			First visit in first trimester		
	Adjusted OR	95% CI	P-value	Adjusted OR	95% CI	P-value
Study group						
C3	REF			REF		
C2	1.88	1.06, 3.34	0.032	1.40	0.76, 2.57	0.279
Age	1.07	0.98, 1.16	0.111	1.06	0.97, 1.15	0.214
Level of education						
Primary	REF			REF		
Secondary	1.30	0.67, 2.54	0.435	1.34	0.64, 2.80	0.444
High	1.68	0.64, 4.40	0.291	1.77	0.69, 4.51	0.232
University	1.99	0.54, 7.37	0.302	1.30	0.38, 4.42	0.675
Previous pregnancies	0.83	0.60, 1.13	0.240	0.74	0.52, 1.05	0.088

Table 9. Effect of both Supervision and Financing (PBF) on bivariate analysis for postpartum mothers

Variable	Four or More ANC Visits			First Visit in First Trimester		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C3	REF			REF		
T1	2.82	1.57, 5.08	0.0005	1.31	0.73, 2.38	0.37

Among the 112 postpartum mothers in T1, 31.3% had their first ANC visit in the first trimester of pregnancy when compared to 25.7% in the 105 postpartum mothers in C3. Postpartum mothers in T1 were 1.31 times as likely to have their first ANC visit in the first trimester when compared to postpartum mothers in C3 (OR=1.31, 95% CI: 0.73, 2.38). The difference in the outcome was not statistically significant (chi-square=0.81, p= 0.37) (Table 9). This difference might have been due to chance.

The average number of ANC visits before delivery for postpartum mothers in C3 was 4 visits with an interquartile range of 3 to 5, while this of ANC visits before delivery for postpartum mothers in T1 was 4 visits with an interquartile range of 4 to 6. The average values were statistically significantly different from each other (Mann Whitney U test p-value=0.0001<0.05)

Among the 124 children in T1, 87.9% had Penta-3 vaccination during IWC when compared to 56.1% in the 114 children in C3. Children in T1 were 5.68 times as likely to have received Penta-3 vaccine when compared to children in C3 (OR=5.68, 95% CI: 2.95, 10.92) (Table 10). The difference in the outcome was statistically significant (chi-square=30.18, p= 0.0000).

Among the 124 children in T1, 61.3% had Measles vaccination during IWC when compared to 24.6% in the 114 children in C3. Children in T1 were 4.86 times as likely to have received Measles vaccine when compared to children in C3 (OR=4.86, 95% CI: 2.78, 8.50) (Table 10). The difference in the outcome was statistically significant (chi-square=32.57, p= 0.00000).

The odds ratio of having four or more visits comparing postpartum mothers in T1 to C3 adjusting for age, highest level of education and number of previous pregnancies was 2.50 (95% CI: 1.35, 4.60, p=0.003) (Table 11). This was statistically significant.

Table 10. Effect of both Supervision and Financing (PBF) on bivariate analysis for children

Variable	Penta-3 vaccination			Measles vaccination		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C3	REF			REF		
T1	5.68	2.95, 10.92	0.0000	4.86	2.78, 8.50	0.00000

The odds ratio of having first ANC visit in first trimester comparing postpartum mothers in T1 to C3 adjusting for age, highest level of education and number of previous pregnancies was 1.18 (95% CI: 0.63, 2.22, p=0.61) (Table 11). This was not statistically significant.

The odds ratio of having first ANC visit in first trimester for each year increase with age comparing postpartum mothers in T1 to C3 adjusting for highest level of education and number of previous pregnancies was 1.10 (95% CI: 1.01, 1.20, p=0.05) (Table 11). This was statistically significant.

The odds ratio of having first ANC visit in first trimester for each unit increase with number of previous pregnancies comparing postpartum mothers in T1 to C3 adjusting for age and highest level of education was 0.63 (95% CI: 0.43, 0.93, p=0.02) (Table 11). This was statistically significant.

3.1.4 Effect of fixed per capita budgetary supplement

Among the 110 postpartum mothers in C1, 72.7% had four or more ANC visits when compared to 69.2% in the 107 postpartum mothers in C2. Postpartum mothers in C1 were 1.19 times as likely to have four or more ANC visits when compared to postpartum mothers in C2 (OR=1.19, 95% CI: 0.66, 2.14) (Table 12). The difference in the outcome was not statistically significant (chi-square=0.34, p= 0.56). This difference might have been due to chance.

Among the 110 postpartum mothers in C1, 30.0% had their first ANC visit in the first trimester of pregnancy when compared to 32.7% in the 107 postpartum mothers in C2. Postpartum mothers in C1 were 0.88 times as likely to have their first ANC visit in the first trimester when compared to postpartum mothers in C2 (OR=0.88, 95% CI: 0.50, 1.57) (Table 12). The difference in the outcome was not statistically significant (Chi-square=0.19, p= 0.67). This difference might have been due to chance.

The median number of ANC visits before delivery for postpartum mothers in C1 was 4 with an interquartile range of 3 to 5 while the median number of ANC visits before delivery for postpartum mothers in C2 was 4 with an interquartile range of 3 to 5. The average values were not statistically significantly different from each other (Mann Whitney U test p-value=0.57.) The differences might have been due to chance.

Table 11. Effect of both Supervision and Financing (PBF) on multivariate analysis for postpartum mothers

Variables	Four or more ANC visits			First visit in first trimester		
	Adjusted OR	95% CI	P-value	Adjusted OR	95% CI	P-value
Study group						
C3	REF			REF		
T1	2.50	1.35, 4.60	0.003	1.18	0.63, 2.22	0.608
Age	0.10	0.91, 1.09	0.949	1.10	1.01, 1.20	0.035
Level of education						
Primary	REF			REF		
Secondary	1.44	0.68, 3.08	0.341	1.20	0.51, 2.83	0.676
High	1.82	0.66, 4.99	0.245	1.22	0.43, 3.46	0.711
University	2.50	0.81, 7.75	0.112	1.45	0.49, 4.25	0.503
Previous pregnancies	1.00	0.71, 1.42	0.989	0.63	0.43, 0.93	0.018

Table 12. Effect of fixed per capita budgetary supplement on bivariate analysis for postpartum mothers

Variable	Four or more ANC visits			First visit in first trimester		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C2	REF			REF		
C1	1.19	0.66, 2.14	0.56	0.88	0.50, 1.57	0.67

Among the 120 children in C1, 77.5% had Penta-3 vaccination during IWC when compared to 76.7% in the 116 children in C2. . Children in C1 were 1.04 times as likely to have received Penta-3 vaccine when compared to children in C2 (OR=1.04, 95% CI: 0.57, 1.92) (Table 13). The difference in the outcome was not statistically significant (chi-square=0.02, p= 0.89). The difference might have been due to chance. Of the 120 children in C1, 67.5% had measles vaccination during IWC when compared to 63.8% in the 116 children in C2. Children in C1 were 1.18 times as likely to have received Measles vaccine when compared to children in C2 (OR=1.18, 95% CI: 0.69, 2.02) (Table 13). The difference in the outcome was not statistically significant (chi-square=0.34, p= 0.55). The difference might have been due to chance.

The odds ratio of having four or more visits comparing postpartum mothers in C1 to C2 adjusting for age, highest level of education and number of previous pregnancies was 0.93 (95% CI: 0.49, 1.77, p=0.82) (Table 14). This was not statistically significant. The odds ratio of having four or more visits comparing postpartum mothers with university education to those with primary education and comparing postpartum mothers in C1 to C2 adjusting for age and number of previous pregnancies was 3.03 (95% CI: 1.08, 8.45, p=0.04) (Table 14). This was statistically significant. The odds ratio of first ANC visit in first trimester comparing postpartum mothers in C1 to C2 adjusting for age, highest level of education and number of previous pregnancies was 0.89 (95% CI: 0.47, 1.68, p=0.72) (Table 14). This was not statistically significant.

3.2 Discussion

For antenatal care to be effective, all pregnant women need a minimum of four visits, at specific times and with evidence-based content. Care for women during pregnancy improves health by preventive measures, and by prompt detection and management of complications[22].

From Table 3, though there was an increase in the percentage of postpartum mothers with four ANC visits or first visit in first trimester, there was no significant effect of financing (financial incentives) on the proportion of postpartum mothers with either four or more ANC visits, or first ANC visit in first trimester or on the number of ANC visits before delivery respectively. This results show that financing alone was insufficient to improve significantly on the coverage of ANC services. After controlling for some socio-demographic variables like age, educational level

Table 13. Effect of fixed per capita budgetary supplement on bivariate analysis for children

Variable	Penta-3 vaccination			Measles vaccination		
	OR	95% CI	P-value	OR	95% CI	P-value
Study group						
C2	REF			REF		
C1	1.04	0.57, 1.92	0.89	1.18	0.69, 2.02	0.55

Table 14. Effect of fixed per capita budgetary supplement on multivariate analysis for postpartum mothers

Variables	Four or more ANC visits			First visit in first trimester		
	Adjusted OR	95% CI	P-value	Adjusted OR	95% CI	P-value
Study group						
C2	REF			REF		
C1	0.93	0.49, 1.77	0.821	0.89	0.47, 1.68	0.719
Age	0.99	0.92, 1.07	0.842	0.96	0.8, 1.04	0.306
Level of education						
Primary	REF			REF		
Secondary	1.44	0.68, 3.02	0.338	1.44	0.65, 3.08	0.376
High	2.29	0.91, 5.73	0.078	1.25	0.50, 3.11	0.628
University	3.03	1.08, 8.45	0.035	1.52	0.58, 3.99	0.398
Previous pregnancies	1.02	0.78, 1.35	0.861	1.06	0.81, 1.38	0.688

and number of previous pregnancies, there was still no improvement in the coverage of ANC services due to financing alone (Table 5). This was not in line with one study in Rwanda [23] which showed a significant effect of the intervention on the chance of having four or more ANC visits but was in line with another study in Rwanda which showed that there were no improvements seen with PBF in the number of women completing four prenatal care visits [4].

From Table 4, there was a significant effect of financing on the coverage of Penta-3 vaccination, a measure of complete vaccination by the Cameroon immunization guidelines while there was no significant effect of financing on the coverage of Measles vaccination, another measure of complete immunization. This confirms the study in Nigeria which says there was no significant effect of the intervention on child immunization using measles as a proxy indicator but was significant with Penta-3 [19]. Also according to a study in Burundi, there was no effect of PBF on vaccination rates [20]. This therefore means that financing results improved the coverage of Penta-3 vaccination in children while financing performance only without supervision did not improve the coverage of measles vaccination. From Table 6, there was a significant effect of supervision only without financing on the proportion of postpartum mothers with four or more ANC visits which was still significant after controlling for age, level of education and number of previous pregnancies (Table 8). Enforced supervision and close monitoring and evaluation of health care activities improves the coverage of four or more ANC visits even without financial incentives based on results. A possible explanation for these significant findings is that increased monitoring and supervision led to increased provider effort which is in line with a study in Rwanda on the effect of PBF on Maternal and Child Health services [4].

Still from Table 6, there was no significant effect of supervision on the proportion of postpartum mothers who had their first ANC visit in the first trimester of their pregnancy which was also not significant after adjusting for level of education and number of previous pregnancies (Table 8). This was in line with a study in Rwanda which showed there was no significant effect of PBF on the chance of having first ANC visit in the first trimester with p=0.544 [24]. There was also significant difference assessing the effect of supervision on the number of ANC visits before delivery. Therefore, supervision even without financial incentives has a positive contribution in improving the number of ANC visits for pregnant women.

From Table 7, there was a significant effect of supervision (which is part of PBF) on the proportion on children who received both penta-3 and measles vaccination which was in line with the study of the effect of the intervention on measles immunization in Nigeria [19]. This therefore means that supervision and close monitoring of health services only without any financial incentives improves the coverage of penta-3 vaccination and measles vaccination as measures of full immunization.

From Table 9, there was a statistically significant effect of both financing and supervision (PBF) on the proportion of postpartum mothers with four or more ANC which was also statistically significant after adjusting for age, level of education and number of previous pregnancies (Table 11). This was in line with the study in Nigeria which reported that the difference between the intervention and the control groups for women having four or more ANC visits was statistically significant and the study and also the study in Rwanda [19, 23]. This therefore means both financing and supervision of health services improves the coverage of postpartum mothers who had four or more ANC visits during pregnancy. The level of significance of both financing and supervision (PBF) was higher than that of supervision alone which means that both financing and supervision improved the proportion of postpartum mothers who had four or more ANC visits than supervision alone or financing alone.

Still from Table 9, there was no statistically significant effect of both financing and supervision on the proportion of postpartum mothers who had their first ANC visit in the first trimester of their pregnancy which was also not statically significant after controlling for age, level of education and number of previous pregnancies (Table 11). This was in line with a study in Rwanda which showed there was no significant effect of PBF on the chance of having first ANC visit in the first trimester with p=0.544 [24]. The effect of both financing and supervision (PBF) on the median number of ANC visits for postpartum mothers was statistically significant.

Postpartum mothers were 1.10 times as likely to have their first ANC visit in the first trimester for

each year increase in their age comparing those in T1 to those in C3 controlling for level of education and number of previous pregnancies. Therefore the older the postpartum mother, the better the chance of having their first ANC visit in the first trimester (Table 11). This was in line with a study which showed that women who were 25 years and older were more than 2 times more likely to utilize antenatal care than women who were 25 years or younger (OR=2.236, 95% CI: 1.106, 4.107) in Nigeria [25] and also that a significant relationship exists between number of ANC visits and the age of the adolescents (p= 0.022) with more ANC visits as age [26].

Postpartum mothers were 0.63 times as likely to have their first ANC visit in the first trimester for each unit increase in number of previous pregnancies comparing those in T1 to those in C3 controlling for age and level of education. Therefore the more the number of previous pregnancies, the better the chances of having their first ANC visit in the first trimester (table 11). This was not in line with a study which showed that Parity had a statistically significant negative effect on adequate attendance [27].

From Table 10, there was a statically significant effect of both financing and supervision (PBF) on the proportion of children who had their Penta-3 and measles vaccination which was in line with the study of the effect of the intervention on measles immunization in Nigeria [19]. This means that financing and supervision improves the coverage of children who receive penta-3 and measles immunization as measures of complete immunization.

From Table 12, there was no statistically significant effect of fixed per capita budgetary supplement on the proportion of postpartum mothers with either four or more ANC visits, or first ANC visit in first trimester respectively. This confirms with a study in Rwanda which showed that no improvements were seen in the number of women completing four prenatal care visits or of children receiving full immunization schedules [4]. This results show that fixed per capita budgetary supplement was insufficient to improve significantly on the coverage of ANC services. After controlling for some demographic variables like age, educational level and number of previous pregnancies, there was still no significant effect of fixed per capita budgetary supplement on the proportion of postpartum mothers with either four or more ANC visits, or first ANC visit in first trimester (Table 14).

Postpartum mothers who had university education were 3.03 times as likely to have four or more ANC visits when compared to those who had primary education and comparing those in C1 to those in C2 controlling for marital status and number of previous pregnancies. Postpartum mothers with university education had a higher chance of having four or more ANC visits than those with only primary education. This was in line with the a study in Nigeria that showed that educational status showed a significant association with respondents having an education of secondary school and above attending ANC clinic more compared to women who had an education of primary school and below and that educated women were 6.8 times (95% CI = 2.7, 16.8) more likely to receive ANC services than those who had no education [25, 28]. There was no statistically significant effect of fixed per capita budgetary supplement on the median number of ANC visits before delivery.

From Table 13, there was no statistically significant effect of fixed per capita budgetary supplement on the proportion of children who received Penta-3 and measles vaccination respectively This confirms with a study in Rwanda which showed that no improvements were seen in the number of women completing four prenatal care visits or of children receiving full immunization schedules [4].

4. CONCLUSION

The degree of the effect of the performance-based financing (PBF) depends on how it is designed which includes financing only, supervision only, both financing and supervision or fixed per budgetary supplement. Financing alone and fixed per capita budgetary supplement alone does not have any effect on the coverage of ANC services but enforced supervision and monitoring has a positive effect on it. Both financing and supervision have a better effect on coverage of both ANC and immunization services than supervision or financing alone.

Educated women are more likely to realize the benefits of using maternal healthcare services. Education increases female autonomy decision-making power within the household and builds greater confidence and capability to make decisions regarding their own health. Older postpartum mothers have better chances of having ANC care services than those that are less old.

CONSENT

Written informed consent was obtained and then administration of the questionnaire to those who consented to be part of the study.

ETHICAL APPROVAL

All authors hereby declare that the study have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. Ethical approval was granted by the Faculty of Health Sciences Institutional Review Board (FHS-IRB) of the University of Buea. Administrative authorization was gotten from the Regional Delegation of Public Health for the South West.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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