

“IMPACT OF THE PRADHAN MANTRI MATRU VANDANA YOJANA ON MATERNAL AND CHILD HEALTH OUTCOMES: A COMPARATIVE ANALYSIS”

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ABSTRACT

Background: The Pradhan Mantri Matru Vandana Yojana (PMMVY) is a conditional cash transfer scheme aimed at improving maternal and child health outcomes in India. This study evaluates the impact of PMMVY on various maternal and child health indicators among beneficiaries and non-beneficiaries in Bhopal, Madhya Pradesh.

Methods: A cross-sectional study was conducted with 420 participants, including 210 PMMVY beneficiaries and 210 non-beneficiaries. Data were collected through structured interviews and analyzed using descriptive statistics and multiple linear regression to assess the association between PMMVY benefits and health outcomes.

Results: The study found that 93% of beneficiaries had at least four antenatal care (ANC) visits compared to 69% of non-beneficiaries. Institutional deliveries were higher among beneficiaries (100%) than non-beneficiaries (93%). Additionally, 97% of beneficiaries' children had complete immunization status compared to 89% of non-beneficiaries. The linear regression analysis revealed that beneficiaries of PMMVY exhibited significantly higher composite health scores ($\beta = 1.432$, $p < 0.001$) compared to non-beneficiaries.

Conclusions: This study reported a significant positive difference towards the intended goals of PMMVY amongst the beneficiaries of the scheme. The intended differences were visible both in process and outcome indicators.

Keywords: Pradhan Mantri Matru Vandana Yojana, maternal health, child health, antenatal care, institutional delivery, immunization, conditional cash transfer, India.

INTRODUCTION

Maternal and child health remains a critical public health issue with high maternal and infant mortality rates, malnutrition, and inadequate healthcare access contribute to the ongoing health challenges¹. In response to these issues, the Government of India launched the Pradhan Mantri Matru Vandana Yojana (PMMVY) in 2017, a maternity benefit program aimed at improving maternal and child health outcomes. The PMMVY provides financial incentives to pregnant and lactating women for their first live birth, with the goal of promoting safe delivery, adequate nutrition, and postnatal care².

The program's significance is underscored by its potential to address several key determinants of maternal and child health, including access to healthcare services, nutritional support, and financial stability during critical periods of pregnancy and early childhood³. Given the ambitious scope of the PMMVY, it is essential to assess its impact on the health outcomes it seeks to improve.

This study aims to provide a comparative analysis of maternal and child health outcomes between beneficiaries and non-beneficiaries of the PMMVY in an urban agglomerate of central India. By examining key health indicators, this study seeks to evaluate the effectiveness of the PMMVY in achieving its intended goals.

Methods-

This study adopts a comparative cross-sectional design to evaluate the impact of the PMMVY on maternal and child health outcomes. The study was conducted over a period of 1.5 years, from August 2022 to January 2024, following ethical approval.

Study Population: The potential participants of the study were antenatal females selected from Anganwadi centres of Bhopal, Madhya Pradesh who were aged more than 19 years and had registered their pregnancy in the Anganwadi centres. Women who experienced child death or were ill at the time of the visit, as well as non-permanent residents of the Anganwadi areas, were excluded from the study.

Sample Size: Based on an estimated pregnancy prevalence of 22% in India and using cluster sampling with a design effect of 1.39 and a 10% anticipated non-response rate, a total sample size of 420 participants was calculated^{4,5}.

Sampling Technique: Cluster sampling was employed due to the absence of a unique identifier sampling frame. Thirty Anganwadi centres (clusters) in Bhopal were randomly selected. Within each cluster, 14 women (7 beneficiaries and 7 non-beneficiaries) were randomly chosen, resulting in a total sample size of 420 participants.

Data Collection

Data was collected through structured interviews and review of medical records. The interviews were conducted using a standardized questionnaire designed to capture information on socio-demographic characteristics, healthcare utilization, nutritional status, and maternal and child health outcomes. Comparative analysis was done to assess differences in maternal and child health outcomes between beneficiaries and non-beneficiaries of the PMMVY. Statistical tests such as chi-square tests were used. To evaluate the impact of the Pradhan Mantri Matru Vandana Yojana (PMMVY) on these outcomes, a multiple linear regression analysis was conducted. The regression

model was adjusted for potential confounders such as education status, age, income, and distance to Anganwadi centers to isolate the effect of PMMVY participation on the composite score

RESULTS

The sociodemographic characteristics of PMMVY beneficiaries and non-beneficiaries reveal important distinctions that may influence their access to and utilization of maternal health services. Beneficiaries were slightly older (mean age: 22.9±2.41) and married later (mean age of marriage: 21.7 ±2.25 years) compared to non-beneficiaries (mean age: 22.3±2.21 years, mean age of marriage: 20.5±2.16 years). 70.4% of the beneficiaries had at least a middle school education when compared to 53.8% of non-beneficiaries but unemployment was prevalent in both groups (70.0% in beneficiaries, 81.4% in non-beneficiaries). Husbands of beneficiaries were more likely to have middle school education or higher (69.6% vs. 66.4%) and were frequently employed in skilled occupations (47.1% vs. 5.7%). Family income tended to be lower among beneficiaries, with 38.6% earning less than ₹10,000 per month compared to 36.2% of non-beneficiaries. Regarding proximity to Anganwadi centers, 34.8% of beneficiaries lived within 500 meters compared to just 12.9% of non-beneficiaries. These sociodemographic differences appear to correlate with notable variations in maternal health service utilization between the two groups which is shown in Table 1.

Table 1: Comparison of ANC registration and checkups among beneficiaries and non-beneficiaries

Domain	Beneficiaries N=210 n (%)	Non- beneficiaries N=210 n (%)	χ^2/t value	test*
Timing of registration of pregnancy				
Within the first trimester	188 (89.5)	140 (66.6)	98.54,	<0.001*
Number of ANC checkups done				
At least 4 ANC checkup	194 (92.4)	144 (68.6)	82.2,	0.005*
Primary place of ANC checkups				
Frontline health facility without doctors	28 (13.3)	23 (11)	129.58,	< 0.001*
Government facility with doctor	162 (77.1)	140 (66.6)		
Private facility	20 (9.6)	47 (22.4)		

A larger proportion of beneficiaries registered their pregnancies within the first trimester (89.5% vs. 66.6%, $p < 0.001$) and had at least four ANC checkups (92.4% vs. 68.6%, $p = 0.005$) compared to non-beneficiaries. Additionally, beneficiaries were more likely to have their ANC checkups at government facilities with doctors (77.1% vs. 66.6%), while non-beneficiaries were more likely to use private facilities (22.4% vs. 9.6%). This trend of higher engagement with government health

services among beneficiaries is further reflected in their utilization of Anganwadi services which is illustrated in Figure 1.

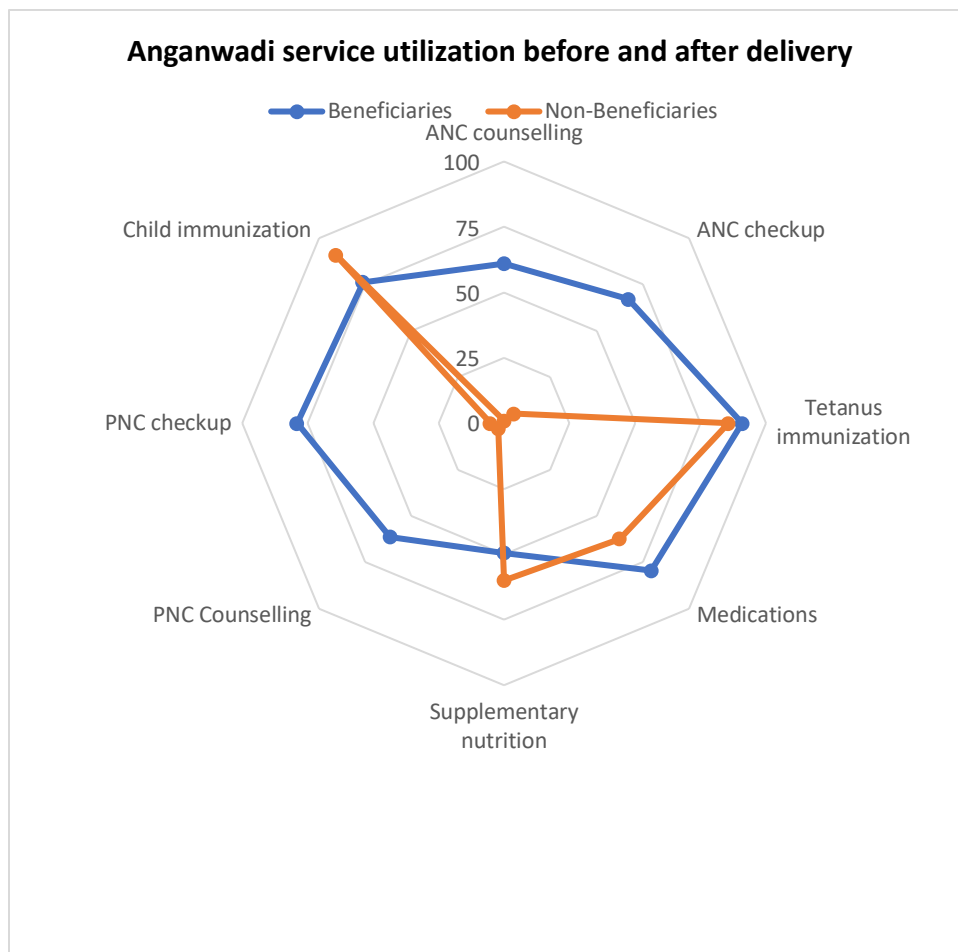


Figure 1: Anganwadi service utilization before and after delivery

During pregnancy, beneficiaries utilized medicine and supplements services more (79.5% vs. 62.4%) and had higher immunization/TT rates (90.9% vs. 85.7%). ANC checkup utilization was significantly higher among beneficiaries (67.1% vs. 5.2%), as was counselling (61% vs. 1%). Post-delivery, non-beneficiaries had higher utilization rates for nutrition/ration (63.3% vs. 54.3%) and immunization/Td services (90.9% vs. 76.2%). However, beneficiaries had significantly higher utilization of postnatal checkups (79% vs. 5.2%) and counselling (61.4% vs. 3%). These differences in healthcare service utilization are reflected in the dietary patterns observed between the two groups as well as shown in Figure 2.

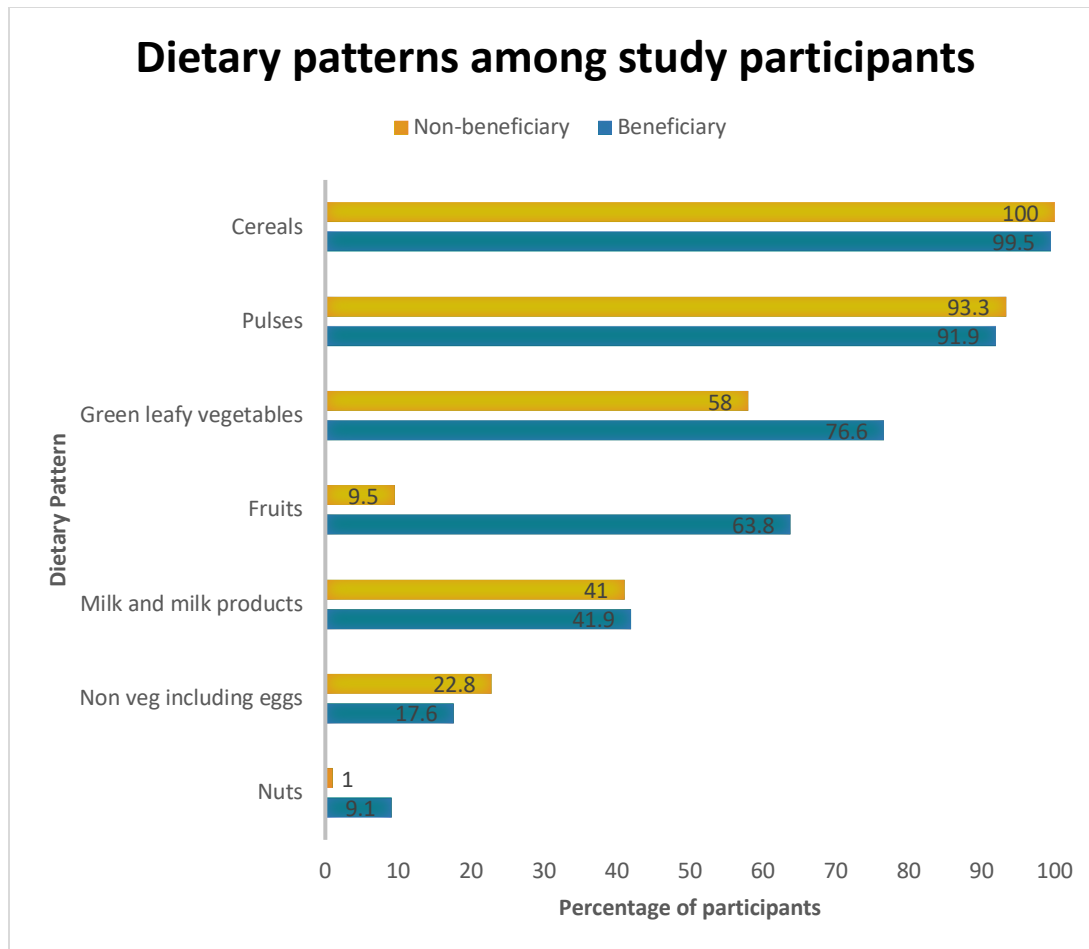


Figure 2: Dietary pattern comparison between Beneficiaries and Non-Beneficiaries of PMMVY

Both groups had similar high consumption of cereals and pulses, but beneficiaries consumed more green leafy vegetables and fruits. Financial constraints were the most perceived reason behind the patterns, affecting 54.2% of beneficiaries and 88% of non-beneficiaries. Household beliefs also influenced dietary choices, with 9% of beneficiaries and only 1% of non-beneficiaries reporting these beliefs as a barrier. Additionally, a lack of awareness regarding the benefits of consuming a variety of foods during pregnancy was evident, with 45% of beneficiaries and 33.3% of non-beneficiaries not recognizing the nutritional advantages. These factors collectively contributed to the restricted food consumption observed in both groups. In addition to this the comparison of process and outcome indicators between PMMVY beneficiaries and non-beneficiaries highlights several key differences which is shown in Table 2.

Table 2: Comparison of process and outcome indicators among beneficiaries and non-beneficiaries

Domain	Beneficiaries N=210	Non- beneficiaries N=210	X ² /t test* p value
Hb level	11.47±1.21	11.01±1.64	3.24*, 0.001
Anemia in pregnancy	23 (11%)	80 (38.1%)	41.79, 0.001
Weight gain during pregnancy	10.56±1.78	8.33±1.24	14.82*, 0.001
Location of delivery			
Home	0	14 (6.7%)	18.66, 0.03
Govt hospital	172 (81.9%)	144 (68.6%)	
Private hospital	38 (18.1%)	52 (24.8%)	
Presence of any complications during delivery	60 (28.6%)	68 (32.4%)	1.778, 0.411
Normal vaginal delivery	161 (76.7%)	128 (61%)	13.21, 0.001
Birth weight of child	2.69 ± 0.27	2.48 ± 0.26	7.9*, 0.001
NICU admission of child	14 (6.7%)	23 (11%)	3.45, 0.178
Completely immunized up to age	205 (97.6%)	187 (89%)	18.21, 0.001

* *t test value*

Beneficiaries showed a significantly lower prevalence of anemia during pregnancy (11% vs. 38.1%, $p < 0.001$) and higher average hemoglobin levels (11.47 ± 1.21 vs. 11.01 ± 1.64 , $p = 0.001$), as well as greater weight gain (10.56 ± 1.78 kg vs. 8.33 ± 1.24 kg, $p < 0.001$). The majority of beneficiaries delivered in government hospitals (81.9% vs. 68.6%, $p = 0.03$) and had no home deliveries. Complication rates during delivery were similar across both groups (28.6% vs. 32.4%, $p = 0.411$). Beneficiaries were more likely to have normal vaginal deliveries (76.7% vs. 61%, $p = 0.001$) and their children had higher birth weights (2.69 ± 0.27 kg vs. 2.48 ± 0.26 kg, $p < 0.001$). Although NICU admission rates were not significantly different (6.7% vs. 11%, $p = 0.178$), beneficiaries' children were more likely to be completely immunized (97.6% vs. 89%, $p < 0.001$). A composite index was constructed to assess maternal and child health outcomes using seven variables across three domains: Maternal nutritional and physiological indicators, maternal health outcomes, and child health outcomes. The composite score, ranging from 0 to 7, was calculated by summing the scores of these variables, with higher scores indicating better health outcomes.

Table 3: Impact of PMMVY Status and other predictors on Composite Score of health outcomes – Linear Regression Analysis

Predictor	Model Coefficients – Composite score		95% Confidence Interval		Test Statistic	
	Estimate	SE	Lower	Upper	t	P value
Age	-0.015	0.0229	-0.06	0.0295	-0.675	0.5
Monthly income	0.0274	0.0132	0.0155	0.0532	2.083	0.038*
Distance from Anganwadi	0.0211	0.0131	-0.045	0.0468	1.62	0.106
Beneficiary of PMMVY	1.4324	0.1187	1.199	1.6658	12.065	<.001*
Above middle school education	-0.69	0.6369	-1.942	0.5623	-1.083	0.279

* *p value statistically significant*

The linear regression analysis for the composite score reveals that being a beneficiary of the PMMVY significantly improves the composite score, with an estimate of 1.4324 ($p < 0.001$). Monthly income also positively affects the composite score, with a coefficient of 0.0274 ($p = 0.038$). However, age and distance from Anganwadi centers do not significantly impact the composite score, with p -values of 0.500 and 0.106, respectively. Education status above middle school is not a significant predictor of the composite score ($p = 0.279$). The model's overall fit was moderate, with an R^2 of 0.301 and an adjusted R^2 of 0.288.

DISCUSSION

The present study aimed to evaluate the impact of the Pradhan Mantri Matru Vandana Yojana (PMMVY) on various maternal and child health outcomes among beneficiaries and non-beneficiaries. The findings revealed significant differences between the two groups, highlighting the positive influence of the PMMVY program on improving maternal and child health indicators. Our study affirms that maternal cash benefits positively influence maternal health behaviors, such as increased antenatal check-ups, higher rates of institutional deliveries, and improved maternal nutrition (Lahariya et al., 2013; Gupta, 2012)⁶. Financial incentives under PMMVY encourage women to seek timely healthcare services, leading to better maternal and neonatal health outcomes. The documented significant improvements in maternal health behaviors among PMMVY beneficiaries included an increase in the number of antenatal check-ups, better dietary diversity, and improved nutrition outcomes.

The higher rates of ANC registration and check-ups among PMMVY beneficiaries are particularly noteworthy. Early registration facilitates timely interventions and continuous monitoring, which are crucial for preventing and managing potential complications during pregnancy. Regular ANC check-ups allow for the monitoring of fetal development, the management of maternal health conditions, and the provision of necessary nutritional and medical support. These findings align with previous studies that have demonstrated the beneficial effects of financial incentives on maternal health behaviors.

In terms of maternal and child health outcomes, the study shows that beneficiaries had better health indicators compared to non-beneficiaries. For example, 93% of beneficiaries had at least four

antenatal care (ANC) visits, compared to only 69% of non-beneficiaries. However, according to the NFHS 5 data, the proportion of women who had at least 4 ANC visits was 75.4% in Bhopal⁷. Institutional deliveries were higher among beneficiaries (100%) compared to non-beneficiaries (93%), which is crucial for reducing maternal and neonatal mortality. The institutional delivery rate is higher in both groups compared to the NFHS 5 data, which showed a 90.7% institutional delivery rate in Bhopal⁸. Additionally, the complete immunization status for children was higher among beneficiaries (97%) compared to non-beneficiaries (89%). The proportion among beneficiaries in our study is higher than the NFHS 5 data, which showed a 77.1% complete immunization proportion among children aged less than 2 years in Bhopal district⁸. These outcomes highlight the positive impact of the PMMVY scheme on promoting maternal and child health through increased access to essential health services.

Beneficiaries of the PMMVY program exhibited lower rates of anemia compared to non-beneficiaries, reflecting the program's effectiveness in addressing maternal anemia, a major public health concern in India. The higher average hemoglobin levels among beneficiaries further supports this finding. Additionally, beneficiaries demonstrated greater weight gain during pregnancy, indicative of better nutritional status and adherence to health recommendations provided during ANC visits. Adequate maternal weight gain is associated with improved pregnancy outcomes and reduced risk of low birth weight in newborns.

The study found that beneficiaries were more likely to deliver in government hospitals and had a higher proportion of normal vaginal deliveries compared to non-beneficiaries. The increased utilization of government health facilities among beneficiaries suggests that the PMMVY program encourages institutional deliveries, which are safer and associated with better maternal and neonatal outcomes. The lower incidence of cesarean sections among beneficiaries may also indicate reduced maternal complications and better management during labor⁹.

Children of PMMVY beneficiaries had significantly higher birth weights and were more likely to be completely immunized compared to those of non-beneficiaries. These findings suggest that the program contributes to improved neonatal health and increased vaccination coverage, which are critical for reducing infant mortality and morbidity¹⁰. Although ICU admissions for complications did not differ significantly between the groups, the overall better health indicators among beneficiaries point to the program's positive impact on child health.

The linear regression analysis reveals significant insights into the impact of PMMVY on maternal and child health outcomes. The model shows that PMMVY beneficiaries have a notably higher composite health score, with an estimate of 1.4324 ($p < 0.001$). This finding indicates that PMMVY beneficiaries experience considerably better health outcomes compared to non-beneficiaries. This effect underscores the efficacy of the PMMVY program in enhancing overall maternal and child health by providing essential financial and social support to pregnant women. Monthly income also plays a significant role in determining health outcomes, with a positive estimate of 0.02735 ($p = 0.038$). This suggests that increased financial resources are associated with improved health outcomes, likely due to greater access to healthcare services, better nutrition, and the ability to afford necessary medical treatments. The positive correlation between income

and health outcomes aligns with existing literature that emphasizes the impact of socioeconomic factors on health¹¹. Interestingly, the distance from Anganwadi centers did not significantly influence the composite health score (estimate = 0.02114, $p = 0.106$). This lack of significance may suggest that while proximity to health services is important, other factors, such as the quality of services provided or the availability of alternative healthcare resources, may have a more substantial impact on health outcomes. Education level beyond middle school was not found to be a significant predictor of the composite health score (estimate = -0.6897, $p = 0.279$). This result implies that while education is generally considered a critical determinant of health, in this context, its impact might be overshadowed by other factors such as program participation and financial support. It is possible that the benefits provided by PMMVY might mitigate the variations typically observed with educational attainment. Overall, the findings highlight the substantial benefits of the PMMVY program in improving health outcomes for its beneficiaries. The significant impact of PMMVY on health indicators reinforces the value of targeted financial and social support programs in enhancing maternal and child health¹².

Despite the positive outcomes observed, sustaining these behaviors beyond the immediate financial incentive remains a challenge. Continuous monitoring and support mechanisms are essential to ensure that beneficiaries adhere to recommended health practices throughout their pregnancy and postpartum period¹³. Integrating comprehensive maternal health education and counseling into the program's implementation framework is crucial. This approach would provide ongoing support and information to beneficiaries, helping them maintain healthy behaviors even after the financial incentives have ceased.

CONCLUSION

This study highlights the significant positive impact of the Pradhan Mantri Matru Vandana Yojana (PMMVY) on maternal and child health outcomes. Beneficiaries of the scheme exhibited substantial improvements in both process and outcome indicators, including enhanced antenatal care (ANC) utilization, reduced rates of anemia, higher hemoglobin levels, increased weight gain during pregnancy, and improved neonatal health metrics. These results underscore the effectiveness of PMMVY in achieving its intended goals through its focus on early registration, regular check-ups, nutritional support, and promoting institutional deliveries. The findings affirm the value of continued investment and potential expansion of PMMVY to further enhance maternal and child health.

LIMITATIONS

The study's reliance on self-reported data may introduce recall and social desirability biases, potentially affecting the accuracy of reported health indicators. Additionally, selection bias may be present, as participants were chosen from Anganwadi centers, possibly leading to an overrepresentation of women with better healthcare-seeking behaviours. The geographic scope is limited to Bhopal, restricting the generalizability of the findings to other regions. The exclusion of women who experienced child death or illness may skew the results towards healthier outcomes.

DECLARATIONS

Funding: Nil

Conflict of interest: Nil

Ethical approval: Ethical committee of Gandhi Medical college, Bhopal, Madhya Pradesh.

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