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LAYERING LIVESTOCK INITIATIVES WITH NUTRITIONAL PROGRAMS: ENHANCING NUTRITIONAL OUTCOMES IN JHARKHAND, INDIA.

Public Health

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ABSTRACT

Malnutrition remains a pervasive challenge in Jharkhand, India, particularly among tribal populations. Factors contributing to this issue include limited access to nutritious food, inadequate healthcare, and socioeconomic disparities. This study explores the integration of livestock interventions with nutritional programs to enhance nutritional outcomes by improving household income and dietary diversity. A quasi-experimental design was employed, comparing households in intervention areas receiving livestock and training with control areas without such interventions. Both groups received nutrition education and support services. The study aimed to assess the impact of livestock interventions on dietary diversity, food security, and nutritional status among children and women. he intervention group showed significant improvements in dietary diversity among children and adolescents, a reduction in severe food insecurity, and a decrease in child wasting. Household income increased notably in the intervention group, leading to enhanced expenditure on nutritious food. The treatment area saw an 11% increase in spending on nutritious foods, compared to a 4% increase in the control area. The intervention markedly enhanced dietary diversity, mitigated severe food insecurity, and diminished child wasting within the treatment cohort, affirming the efficacy of amalgamating livestock initiatives with bolstered nutrition services. By addressing economic barriers and enriching household dietary diversity, livestock interventions serve as a pivotal mechanism for nutritional improvement.

KEYWORDS

Nutrition Sensitive Social Protection, Livestock interventions, Nutritional outcomes, Jharkhand, India

BACKGROUND

Malnutrition emerges as a critical global health challenge, disproportionately impacting millions of children within low- and middle-income nations. It serves as a pivotal marker for assessing nutritional status and overall health within communities, reflecting broader issues such as limited access to nutritious sustenance, suboptimal maternal health conditions, insufficient healthcare infrastructure, inadequate sanitation facilities, and pronounced socioeconomic inequities. The manifestation of malnutrition in children not only indicates potential compromises in their immunological defenses, growth trajectories, and cognitive development but also underscores the urgency for targeted interventions. A seminal study by the Lancet in 2019 highlighted the acute prevalence of malnutrition in India, revealing it as the primary risk factor contributing to mortality among children under five across all Indian states in 2017, accounting for 68.2% of total under-five fatalities. Furthermore, malnutrition was identified as the leading contributor to health loss across all age groups, responsible for 17.3% of total disability-adjusted life years (Swaminathan et al., 2019). Despite governmental efforts to mitigate this complex issue, malnutrition persistently undermines India's developmental strides.

Jharkhand, an eastern state of India with a significant (26%) tribal population, has a high prevalence of childhood wasting, a condition exacerbated by malnutrition. According to World Health Organization (WHO) growth standards, an alarming 22.4% of children aged 0-59 months in Jharkhand are affected by wasting. Additionally, the state records the highest percentage (26.2%) of women of reproductive age with a low Body Mass Index (BMI <18.5 kg/m^2), surpassing the national average of 18.7% (IIPS, 2019-21). The nutritional disparities are particularly pronounced among the Scheduled Tribes (ST) in comparison to their non-ST counterparts, highlighting the intricate interplay between socio-economic factors and nutritional outcomes. The historical context of tribal communities, marked by significant economic, political, social, and cultural transformations, has led to a deterioration in their traditional life-support systems, including access to land, forests, water, and other natural resources. This disruption has adversely affected the living conditions and health status of the tribal populace in India, precipitating a shift in dietary practices among tribal groups. The transition away from diverse dietary habits, compounded by reduced access to forests, loss of livelihoods, migration, acculturation, and increased dependence on public distribution systems, has led to inadequate consumption of micronutrient-rich foods such as green vegetables. This, coupled with a lack of nutritional awareness among tribal women, has precipitated significant health issues, including undernutrition and anemia, necessitating comprehensive and culturally sensitive interventions to address these pressing health concerns (Bang et al., 2018).

Integrating, livelihood, especially livestock, interventions have the potential to address several key factors contributing to malnutrition in Jharkhand, including limited access to nutritious food and micronutrient deficiencies. While it has been commonplace to blame undernutrition on people's ignorance of what foods to eat, the main obstacle to access is usually economic in circumstances where foods are available. People may be unable to afford a diet that meets their needs for energy and nutrients even if they know what foods to eat or aspire to eat. Of all the barriers to food access, cost and affordability are among the most important, particularly concerning nutritious food. Dash et al. found that the cost of a nutritious diet in the same intervention geography is two and a half times more expensive than a calorie-only diet (Dash et al., 2022). Dash et al used various scenario-based modelling and calculated the impact of various nutrition-sensitive interventions, including livestock distribution, on minimizing the affordability gap of a nutritious diet.

Several studies have highlighted the positive impact of livestock interventions on nutrition. For instance, Lindahl et al. (2020) emphasized the positive outcomes of livestock transfer combined with training and resources, provision of livestock foods, and empowering farmers to manage livestock-related problems effectively (Lindahl et al., 2020). Similarly, Randolph et al. (2007) emphasized the impact of livestock keeping on human nutrition and health, indicating its potential to improve nutrition outcomes (Randolph et al., 2007). Furthermore, Rawlins et al. (2014) found that increasing livestock ownership in developing countries can significantly increase the consumption of nutrient-dense animal-source foods and improve nutrition outcomes (Rawlins et al., 2014).

However, it is important to note that the effectiveness of livestock interventions on nutrition outcomes may vary. While some studies have reported positive impacts, others have found limited or no impact of certain livestock development programs on nutrition outcomes (Dumas et al., 2018). Additionally, it highlighted gaps in evidence regarding the impact of livestock interventions on nutritional outcomes, indicating that the number of studies assessing the impact of suitable quality is limited (Dominguez-Salas et al., 2019). Furthermore, Bandiera et al. (2017) emphasized the potential of livestock ownership to improve child nutrition through various mechanisms but noted that direct evaluations of household livestock and child stunting status are uncommon (Bandiera et al., 2017).

METHODOLOGY:

The study used a quasi-experimental, prospective, case-control methodology, comparing households and communities where livestock interventions were implemented to those where no livestock interventions were implemented. The intervention area consisted of 75 households that received livestock distribution and related training. Another set of 75 households from the neighboring panchayat (village council) formed the control area where no such livestock distribution happened.

As shown in Table-1, nutrition education and systems support to strengthen coverage of essential nutrition services were common in both the areas. The authors measured various nutrition outcomes, including dietary diversity, nutrient intake, and anthropometric measures, before and after the implementation of livestock interventions.

Table 1: Intervention's Design

Intervention	Intervention	Control
System strengthening to improve access to quality nutrition services	✓	✓
Nutrition education and counselling through NCCS	✓	✓
Promotion of locally available healthy diet	✓	✓
Livestock distribution	✓	X
Group formation and financial literacy	✓	X

Quantitative data collection was meticulously executed across 150 households to comprehensively grasp dietary patterns. An assessment of the Household Food Insecurity, Minimum Dietary Diversity of children, adolescents and women, offering a nuanced understanding of nutritional practices, was done. The study further incorporated the measurement of critical nutritional indicators, specifically Wasting for children to understand overall health status. In addition to nutritional parameters, an in-depth analysis of income and expenditure patterns on both food and non-food items was conducted, providing valuable insights into the economic dimensions.

The intervention advocated for holistic domestic animal husbandry, focusing on the breeding of pigs, goats, chickens, and ducks. Women were organized into groups and endowed with baskets containing a mix of these animals, chosen for their differing reproductive cycles to bolster both household income and nutrition. Within 30-45 days, ducks and chickens began producing eggs, while pigs and goats required 3-8 months to reproduce, ensuring a steady supply of eggs or meat for either consumption or sale. This approach not only diversified dietary options but also aligned with cultural norms and provided sustained economic benefits. The 14-month initiative, spanning from July 2022 to August 2023, integrated financial literacy, emphasizing savings and economic resilience.

Furthermore, the program forged strategic partnerships with local veterinarians, livestock experts, and NGOs, establishing a robust support network for animal husbandry. These collaborations facilitated both direct and indirect support channels, ensuring participants had access to the necessary resources and expertise for successful livestock management.

The cross-cutting nutrition interventions included structured awareness sessions through Nutrition Counselling and Childcare Sessions (NCCS). These sessions served as a platform for multifaceted engagement, encompassing crucial aspects of nutrition, child care, and hygiene. The NCCS covered topics such as the importance of a balanced diet, optimal feeding practices for infants and young children, hygiene practices, and the prevention of malnutrition. The Nutritional activities also featured nutritious local diet preparation and feeding sessions, providing hands-on demonstrations of recipes tailored to local affordable food items. To ensure sustained impact, follow-up sessions were conducted through home visits, where mothers and caregivers received ongoing support in implementing and adapting newfound nutrition knowledge and practices in their daily lives. A dietary calendar was used as a behavioral nudge to promote consumption of healthy diet.

RESULTS:

The demographic and socio-economic characteristics of the households participating in the study are presented in **Table-2**, comparing the treatment and control groups to ascertain baseline equivalences and disparities. The proportion of adult members in the sampled households was slightly higher in the treatment group (52.8%) compared to the control group (44.4%), while the percentage of children aged 0-18 years was correspondingly lower in the treatment group (47.2%) than in the control group (55.6%).

Both groups exhibited an identical average household size of 2.5 members, suggesting a similar family structure across the study cohorts. A significant majority of the households in both groups were from Scheduled Tribes, with a higher prevalence in the treatment group (97.2%) compared to the control group (90.5%), reflecting the study's focus on tribal populations.

Educational attainment among parents revealed notable differences between the two groups. Mothers in the treatment group had a higher percentage of higher secondary education (18.1%) compared to those in the control group (9.5%), while the percentage of illiterate mothers was slightly lower in the treatment group (33.3%) than in the control group (35.1%). Fathers in the treatment group exhibited a substantially lower illiteracy rate (2.9%) compared to the control group (9.5%), and a higher proportion had attained higher secondary education (25.7% in the treatment group vs. 14.9% in the control group).

Occupational profiles differed markedly between the two groups. Among mothers, a higher percentage in the treatment group were engaged in cultivation (58.3%) as opposed to agricultural wage labor (34.7%), contrasting with the control group where 60.8% were involved in agricultural wage labor and only 36.5% in cultivation. Fathers in the treatment group also showed a diverse occupational spread, with a lower percentage engaged in agricultural wage labor (24.3%) and a higher percentage in non-agricultural wage labor (44.3%) compared to the control group, where 66.2% were involved in agricultural wage labor and only 20.3% in non-agricultural wage labor.

Table 2: Demographic And Socio-economic Profile

		Treatment	Control
% Of adult member in the sampled households		52.8	44.4
% Of children (0-18 years) in the sampled households		47.2	55.6
Average household size		2.5	2.5
Caste (Scheduled Tribe) (%)		97.2	90.5
Education of mother (%)	Illiterate	33.3	35.1
	Primary	15.3	16.2
	Secondary	30.6	36.5
	Higher Secondary	18.1	9.5
	Graduate	2.8	2.7
Education of father (%)	Illiterate	2.9	9.5
	Primary	20.0	18.9
	Secondary	50.0	55.4
	Higher Secondary	25.7	14.9
	Graduate	1.4	1.4
Primary Occupation of mother (%)	Agricultural wage labour	34.7	60.8
	Cultivation	58.3	36.5
Primary Occupation of father (%)	Agricultural wage labour	24.3	66.2
	Cultivation	27.1	13.5
	Non-agricultural wage labour	44.3	20.3

Source: Primary Household Survey, 2023

Change In Income And Its Effect On Food Expenditure

The investigation revealed a significant enhancement in household

(HH) income attributable to the intervention, with an observed mean augmentation of INR 5,552.55 per household. This increment contributed to an aggregate elevation of INR 394,231 in total income across the participant spectrum. Furthermore, the intervention fostered more robust consumption habits, evidenced by an average expenditure of INR 2,702 on eggs and meats per household, culminating in an overall spending of INR 191,904. In parallel, the initiative bolstered savings practices, with households saving an average of INR 2,056, thereby contributing to a collective savings pool of INR 146,000 within the realm of financial inclusion.

Moreover, the intervention catalyzed the accrual of significant assets, with the average value of livestock per group reaching INR 120,000, aggregating to a total of INR 598,700. This accumulation signifies a noteworthy 18.5% escalation in net asset value, underscoring the tangible economic benefits engendered by the intervention.

The augmentation in income was instrumental in enhancing food-related expenditures, particularly in the domain of nutritious food. The treatment area witnessed an 11% uptick in spending on nutritious food, a direct corollary of the increased income levels. Conversely, the control area registered a modest 4% rise in similar expenditures, predominantly ascribed to the influence of counseling initiatives. This differential underscores the pivotal role of income enhancement in facilitating improved nutritional intake among the target populations. T**able-3** presents the outcomes of layering livestock interventions into nutrition projects aimed at improving nutritional outcomes in Jharkhand, measured at two time points: baseline (May 2022) and end line (August 2023). The indicators assessed include Minimum Dietary Diversity (MDD) for children, women (W), and adolescent girls, severe food insecurity, and the prevalence of wasting among children. For MDD among children, the treatment group showed a significant improvement, with the percentage meeting the MDD criteria (consuming at least 4 out of 7 food groups and assessed through 24-hour recall) increasing from 14.3% at baseline to 69.0% at end line, compared to the control group, which also improved from 38.6% to 50.0%. Among women, the treatment group's MDD scores improved from 81.2% to 83.3%, while the control group saw a decrease from 64.0% to 52.7%. Adolescent girls in the treatment group exhibited a notable increase in MDD, from 72.7% to 87.5%, whereas the control group experienced a slight decrease from 70.5% to 63.6%.

Severe food insecurity levels decreased in both groups, with the treatment group showing a more substantial reduction from 38.7% to 15.0%, compared to the control group's decrease from 31.3% to 22.0%. The prevalence of wasting among children in the treatment group decreased from 35.7% to 17.8%, while the control group also saw a reduction from 26.6% to 21.1%.

Table 3: Changes In Nutritional Outcomes From Baseline To Endline

Indicator	Group	May 2022 (Baseline)	Aug 2023 (Endline)
MDD - Children	Control	38.6%	50.0%
	Treatment	14.3%	69.0%
MDD - Women	Control	64.0%	52.7%
	Treatment	81.2%	83.3%
MDD - Adolescent Girl	Control	70.5%	63.6%
	Treatment	72.7%	87.5%
Severe Food Insecurity	Control	31.3%	22.0%
	Treatment	38.7%	15.0%
Wasting - Children	Control	26.6%	21.1%
	Treatment	35.7%	17.8%

Source: Primary Household Survey, 2022 and 2023

Note: MDD refers to Minimum Dietary Diversity. Wasting is defined as low weight-for-height in children.

DISCUSSION:

In India, livestock interventions have shown promising potential to improve nutrition outcomes, particularly in resource-poor settings. A qualitative study in southern India found that access to irrigation, ownership of livestock, and increased income had positive impacts on household nutrition (Pradyumna et al., 2020). Furthermore, a critical analysis of the livestock sector in India highlighted a shift from a deficient to a positive balance in India's trade of livestock and livestock products (Sonavale et al., 2020). This indicates the potential for livestock interventions to contribute to economic development and potentially improve nutrition outcomes in India.

Livestock ownership has been associated with improved household dietary quality in rural India, suggesting a positive link between livestock interventions and nutrition (Pradyumna et al., 2020). Additionally, a study assessing the role of livestock in improving women's bargaining power and its effects on children's nutritional status in rural India found that livestock play a significant role in household decision-making and resource allocation, potentially impacting nutrition outcomes (Jumrani & Birthal, 2015).

However, it is important to note that the effectiveness of livestock interventions on nutrition outcomes may vary. While livestock interventions have the potential to improve nutrition outcomes, it is essential to consider the complexity of the role livestock play in household decision-making and the potential for misconceptions to impact their contribution to human well-being (Randolph et al., 2007). The findings of this study underscore the potential for a synergistic convergence between the Poshan Abhiyaan (National Nutrition Mission) and the National Rural Livelihoods Mission (NRLM) and Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) interventions, offering a strategic avenue to simultaneously tackle the dual challenges of malnutrition and poverty in rural settings. The inherent synergies between these two pivotal programs present an opportunity for an integrated approach that leverages the strengths of each to foster comprehensive community empowerment.

By amplifying the scale of successful livelihood initiatives, particularly those centered around livestock, which have demonstrated effectiveness in boosting household income, improving dietary habits, and facilitating asset growth, we can significantly mitigate the severity of malnutrition across diverse age cohorts. Such interventions not only bolster economic resilience among rural populations but also lay the groundwork for sustained nutritional improvements.

Moreover, the integration of nutrition-sensitive and specific social protection measures within this collaborative framework can further enhance the collective well-being of rural communities. It is imperative to devise a holistic strategy at both the national and state levels to actualize this convergence, ensuring its subsequent implementation extends down to the district and block levels.

Nonetheless, it is crucial to tailor these strategies to accommodate the unique dietary preferences and cultural beliefs of different communities. This nuanced approach will ensure that the convergence of Poshan Abhiyaan and NRLM & MGNREGS interventions remain culturally sensitive and inclusive, thereby maximizing its impact on eradicating malnutrition and alleviating poverty in rural India.

Limitation Of The Study:

While the study adopted a case-control design, constraints related to sample size precluded the application of more advanced statistical analyses such as regression, difference-in-differences, or other causal inference methods, rendering them either unfeasible or yielding insignificant results. Consequently, the outcomes derived from this intervention warrant further exploration across a broader population to substantiate the initial hypothesis. Additionally, the research was confined to quantitative inquiry, which inherently restricts the depth of qualitative insights and the exploration of nuanced attributes associated with the intervention's impact.

CONCLUSION:

The intervention's impact on the treatment group was profound across several indicators, particularly in improving dietary diversity among children and adolescents and in bringing down severe food insecurity. The significant reduction in child wasting further underscores the effectiveness of the intervention. These findings suggest that effective layering of livestock interventions with strengthened nutrition services can lead to substantial improvements in nutritional outcomes in vulnerable populations. Integrating livestock interventions has the potential to improve nutrition outcomes by addressing economic constraints and improving household dietary diversity. Policymakers and practitioners should consider scaling up these integrated interventions to broader populations, ensuring tailored adaptations to meet specific community needs and cultural contexts for more widespread nutritional and health benefits.

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