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Interrelationship between agriculture and nutrition for enhancement in nutritional status of pregnant women

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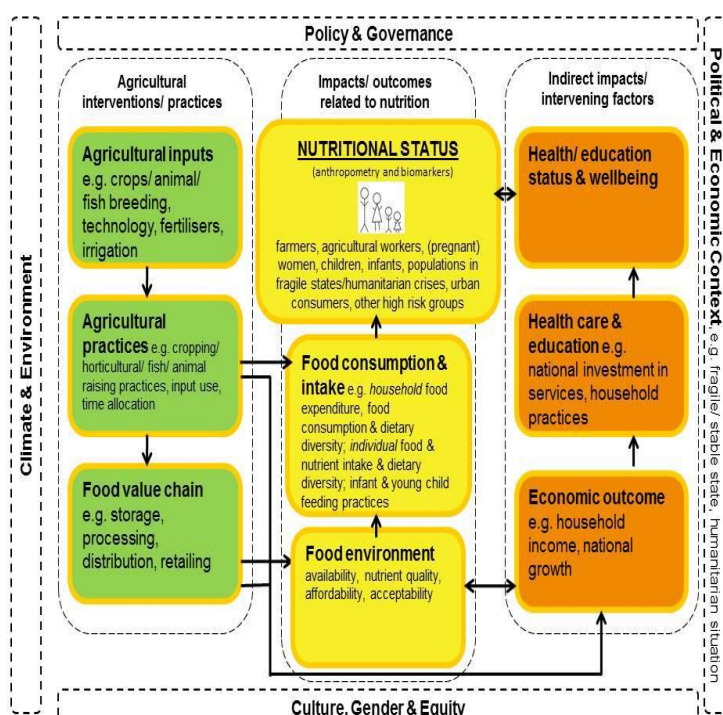
Abstract

In Bihar 45% of women has a BMI below 18.5, indicating a high prevalence of nutritional deficiency and 58.3% pregnant women are anaemic (NFHS-IV, 2015-2016). The aim of the study is to raise Nutrition status of Pregnant women of Patna district by application of direct agriculture intervention method i.e. sack farming, kitchen gardening, livestock production and adopting new technology of farming SRI and SWI etc and by behavior change communication. Cross-sectional study was carried out over a period of 1 year on 200 pregnant women (age 18 to 35 year) from 1st trimester to till birth of babies. Samples were selected by incidental-cum purposive sampling. Anthropometric measurements and bio-chemically measurement were recorded using standardized methodology as recommended by World Health Organization along with BCC. Baseline and end line data were analysed. Data were analyzed using computer software Microsoft Excel for windows and all results were evaluated statistically by applying the SPSSPC package (version 9.0, SPSS, Chicago, Illinois, USA.). Baseline and end line data were analysed. Majority of pregnant women were from low socioeconomic group (59%), joint family (62.5%) and illiterate (34.7%). Majority of women, when bio-chemically examined they were found in anaemic condition at baseline 8.8 ± 0.82 but at end line the level was 11.88 ± 1.18 . The mean of Body Mass Index (BMI) of pregnant women were 17.4 ± 1.67 and 23 ± 2.35 respectively baseline and end line. Seventy one per cent of women have been given the birth of normal body weight babies. There was great impact on the nutritional status of pregnant women who got balanced diet due to improvement in production in agricultural products and consumption of food product by women regularly and improvement in behavioural change due to nutrition education.

Keywords: Pregnant, woman, nutrition- status, agriculture, behaviour change communication

Introduction

Agriculture's main role is to deliver an affordable, accessible and nutritious diet for all without doing nutritional harm (Brown, 2014). Agricultural development is seen as the main pathway to contribute to food and nutrition security.



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Pregnancy is a crucial period of woman's life where socio demographic factors and other factors like lifestyle pattern, food choices and dietary habits, determine the health of future generation (Madhavi, 2011). The nutrient demands of the foetus developing must be met in addition to those for maintenance of the adult women; this calls for quality nutrition both before and during pregnancy (Saxena *et al.*, 2015) Pregnancy is a prominent event in a woman's life, able to transform her life forever. It is a physiological state, which produces several normal and expected changes, in all the maternal organ systems. Poor maternal nutrition results in low birth weight infants which is a major cause of the increased rate of maternal and child morbidity and mortality. Maternal nutrition plays a fundamental role for healthy pregnancy and foetus. Nutritional requirements increase tremendously during pregnancy as the expectant mother not only has to nourish her but also the growing foetus (Khanna *et al.*, 1997). The nutrient needs are also increased for the development of maternal organs such as uterus, placenta and breast tissue and to build up body reserves to be utilized at the time of delivery and subsequently during lactation (ICMR, 2010). Increasing agricultural productivity and promoting good nutrition are deeply interrelated aspects of addressing hunger and poverty. The relationship between agriculture and human nutrition is far more complex than the relationship between food production and food consumption or the economic relationship between food supply and food demand. The belief that "agriculture contributes not just to food production but also to human nutrition and health" (IFPRI 2012) underpins ongoing efforts to "make agricultural policies and programs nutrition-sensitive" (Ruel *et al.* 2013) Figure-1:

Agricultural practices or interventions with nutrition-related outcomes either directly or indirectly. Webb (2013)

Dietary diversity has been long known by nutritionists as a key element of high quality diet as it allows for the consumption of a wider variety of food groups (Chatterjee, 2016). Ruel (2003) summarized that dietary diversity is a promising measurement tool and the existing literature confirms association across dietary diversity, dietary quality, nutrient adequacy and food security.

In Bangladesh, nutritional deficiencies -- in energy, vitamins, and minerals -- are widespread, particularly among pregnant women and young children. Poor nutrition during the 1,000-day period from conception through the first two years of life adversely affects the development of the child's future health and productivity (Fahmida, 2015)

Materials and Methods

The present research was conducted in Paliganj block of Patna district, Bihar. Two hundred respondent Pregnant women from different social status (aged between 18-35years) were selected by incidental -cum -purposive random sampling. A protested schedule was used for gathering information. Information regarding socio-economic status, information

related to nutrition, health and information regarding environmental sanitation was collected by personal interview method and survey (Baseline and after delivery end line)

Behaviour Change Communication to pregnant women:

- Consumption of locally & seasonal available food material focussed on diet diversity
- Food production primarily for household consumption by various method with minimum input and maximum output eg: Kitchen gardening, sack farming, Change in life style, focused on hygiene & sanitation

Nutritional Status Assessment

- Anthropometric assessment: MUAC, weight during antenatal period
 - Mid-upper arm circumference was measured to the nearest 0.1 cm using a flexible non-stretch tape. The women stood erect and sideway to the measurer. The point at the midpoint of upper left arm i.e. midway between acromion process and tip of the olecranon was located. The tape was wrapped gently, but firmly around the arm at midpoint and the measurement taken.
 - Pregnancy outcome date, birth weight, length and head circumference were obtained during physical examination of the newborn infant by the midwife within 24 hours of delivery. Infants who were less than 2500 grams at birth were considered as infants with low birth weight
- Biochemical assessment: Haemoglobin testing with liasoning at VHSND
- Dietary assessment: Food security was measured by 24 hour dietary recall method and by using food frequency questionnaire(FFQ).The questionnaire had both structured and semi-structured questions

Data Analysis

Data were analyzed using computer software Microsoft Excel for windows and all results were evaluated statistically by applying the SPSSPC package (version 9.0, SPSS, Chicago, Illinois, USA.). Data were presented as percentages for qualitative variable. Qualitative variable mean and Standard deviation were calculated.

Results and Discussion

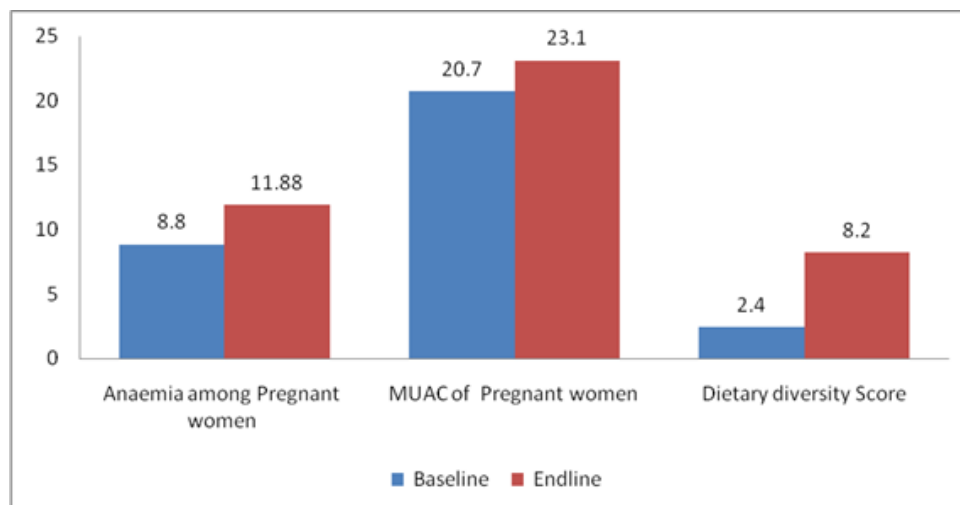
Table 1 shows the results for the minimum household monthly income was Rs 5000 which is far less than government's announced minimum wage rate of Rs 7000. The age of household head ranged from 18 to 39 years with an average of 28.5 years. Average household size of selected households was 5-8 persons per household that was 61.5 per cent with minimum of 0-4 member that was 22.5 per cent and maximum of 9-12members. Majority of respondent were illiterate which directly and indirectly related to nutrition security

Table 1: Socio-economic information of the families of selected rural women (N=200)

Characteristics	Details	Number	Percent
Type of family	Nuclear	75	37.5
	Joint	125	62.5
No. of family member	0-4	45	22.5
	5-8	123	61.5
	9-12	22	11
Monthly income of family	Upto 5000	118	59.0
	5001-10000	63	31.5
	≥10000	19	9.5
Age of respondent	18-24	97	48.5
	25-31	53	26.5
	32-39	50	25
Educational status	Illiterate	69	34.5
	Can read only	25	12.5
	Can read and write only	23	11.5
	Up to primary	33	16.5
	Up to middle	29	14.5
	≥ Matriculation	21	10.5

Majority of women, when bio-chemically examined they were found in anaemic condition at baseline that was 8.8 ± 0.82 , behavioural change communication and enhancement in diet diversity by consumption of locally available seasonal fruits and vegetables, there was significant improvement in level of Hb that was 11.88 ± 1.18 . There was also significant improvement in Mid upper arm circumference of pregnant women at end line than baseline. Low-income households typically subsist on monotonous staple-based diets and lack of diet diversity is associated with inadequate intake and risks of

deficiencies of essential micronutrients. Food production is just one factor in the availability and consumption of nutrients^[4]. Food is stored, distributed, processed, marketed, prepared, and consumed in ways that affect the access, acceptability, and nutritional quality of foods for consumers during critical stages of the life cycle. Due to change in lifestyle and consumption of diet with diet diversity as per RDA there is significant improvement was found in nutrition status of pregnant women.

**Fig 2:** Comparative changes in nutrition status of pregnant women

Majority of women were anaemic at baseline but it was greatly improved due to BCC and consumption of diet with variety due to kitchen garden. There was significant improvement in the mid upper arm circumference of women ($p > .001$). There dietdiversity score also greatly improved. Dietary diversity is a qualitative measure of food consumption that reflects household's access to a variety of foods, and

improves the nutritional adequacy of individual's diets. Similar result were also seen in studies by Ruel, 2003 and Kennedy *et al.*, 2007. An increase in dietary diversity is associated with socioeconomic status and household food security measured in terms of household energy availability (Jones *et al.*, 2014, Lo, *et al.*, 2012; Thorne-Lyman *et al.*, 2009 and Faber *et al.* 2009)

Table 2: Improvement in Nutritional Status

S. No	Indicator	Mean Weight(Kg)
1.	Increase in weight during complete antenatal period of women	10.13±1.1
2.	At birth weight of Infant	2.82±0.46

Total gestational weight gain correlated significantly with nutrient intake, it was found moreover similar than standard weight gain ($p < .001$) Result was similar with study of Tillar *et al.*, 2011. The mean birth weight of the newborns (2.82 ± 0.465 kg) was within the normal range of the reference standard ($2.7-2.9$ kg) (Durrani *et al.*, 2011) A study in Andhra Pradesh, India, also assessed the effects of introducing a homestead garden and backyard poultry intervention to improve maternal and child micronutrient intake during pregnancy and the first 24 months of the child's life by increasing access through agricultural production and using BCC to improve knowledge and practices (Murty *et al.*, 2016).

Conclusion

This paper has attempted to explore the nature of relationship between agriculture and nutrition based on crop production (crop diversity) and nutrition intake (dietary diversity). Association between agriculture and nutrition outcomes is particularly useful in highlighting production-consumption diversity linkages. In general, production diversity was found to be important for dietary diversity mostly, if not only, among households that have limited access. Maternal nutrition status prior to delivery and gestational age influenced birth outcomes. Hence, in order to reduce the adverse pregnancy outcomes awareness should be created among pregnant women and women of child bearing age about the factors that can improve the nutritional status of the women prior to conception and during

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