Is Interventions Programmes impact on nutritional status and health among mothers and children in Empowered Action Group (EAG) states, India: An evidence from the NFHS-IV

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Introduction

Nutrition is the process by which living organisms take in and use food for the maintenance of life, growth, the functioning of organs and tissues(Bender & Bender 1995). 'Nutrition' has been used in the past to describe both an input (consumption of nutrient) and output. If nutrition is considered as an input, then the focus will be primarily on food. If it is to be viewed as an outcome, recognized as a disease. Nutrition plays a significant role throughout life, and it should be a priority at national and subnational levels because it is central to human, social and economic development(Bryce et al., 2008). Food security is also a fundamental right for all people. It is defined as a state which. "All people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996). The second International Conference on Nutrition, Rome 2014 adopts global nutrition targets for improving maternal, infant and young child nutrition and for no communicable disease risk factor reduction to be achieved by 2025(FAO, 2014).

Malnutrition is as a form of undernutrition including stunting, wasting, and deficiencies of essential vitamins and minerals. Another form includes obesity or over-consumption of specific nutrients. Undernutrition among women and children is the underlining cause of 3.5 million deaths, 35% of disease burden in children younger than five years and 11% of total global DALY(Black. R. E., et al., 2008). Despite the impressive economic growth, India experiences pervasive and persistent children and maternal malnutrition. Maternal and child undernutrition, including both undernutrition and overweight, are global phenomena. It is necessary consequences for survivals, the incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies(Bhutta Z. A. et al., 2008; Black R. E. et al., 2008; Bryce et al., 2008; Victora et al., 2008). Maternal undernutrition contributed to poor fetal and early childhood growth and increased infant morbidity and mortality, with long-term adverse consequences for child development and life-long health(Black R. E. et al., 2013).

The united nation's stainable development goals to provide a historic opportunity to implement interventions, at scale, to promote early childhood development. According to the fact and figure presented in a meeting held at September 25[th,] 2015, globally one in nine people in the world today are undernourished while the vast majority of the world's hungry people live in developing countries, where 12.9 percent of the population is undernourished. Also, the figure shows poor nutrition causes nearly half of deaths in children under five about 3.1 million children each year. One in four of the worlds' children suffers stunted growth. In developing countries, the proportion can rise to one in three. All countries adopted a set of goals to end poverty, protect the planet and ensure the prosperity for all as part of a new sustainable development agenda. Each goal has a specific target to be achieved over the next 15 years. The United sustainable development set a

target to end hunger and ensure access by all people, particularly the poor and people in the vulnerable situation, including infants, to safe, nutritious and sufficient food all year round by 2030. The second target mainly focused on malnutrition, to end all forms of malnutrition including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under five years of age and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons(UNDP, 2015).

Although the evidence base for the importance of early childhood development has grown, the research is distributed across sectors, population, and setting, with diversity noted in both scope and focus. Advances in basic and intervention science indicate that early childhood is a period of particular sensitivity to experiences that promote development and the critical time windows exist when the benefits of early childhood development interventions are amplified. Nurturing care and protection are supported by a range of interventions delivered pre-pregnancy and throughout the birth and the newborn period, infancy and early childhood, many of these interventions have shown benefits for child development, nutrition, and growth and reductions in morbidity, mortality, disability and injury(Britto et al., 2017).

Worldwide, nearly one-third of people suffer from as a result of malnutrition wasting, stunting, vitamin, and mineral deficiency, overweight or obesity and diet-related non-communicable diseases(WHO, 2017). The latest estimates show that around 38 and 36 percent of India's children aged 0-5 years are stunted and underweighted respectively(IIPS, 2017). The children need unique nutritional intake during preschool age period for their extensive growth or development(Lee & Nieman, 2003). The Indian government has introduced two-step approach to reducing children, and mother nutrition first is the Public Distribution System, which makes food available at a subsidized price and second is the ICDS. The Integrated Child Development Services (ICDS) scheme is one of the most massive national programmes for the promotion of mother and children health and their development (Kapil & Pradhan, 1999).

India has a unique opportunity now to improve the health and nutritional status of its people. The country is in a position to invest increasing amounts of resources in social sectors as a result of economic and nutrition for national development the prospects for improved and equitable health and nutrition are now better than they have ever been. Reproductive health and child health and nutrition are core priorities for any country, more so for India with the world's highest burden of maternal, newborn, and child deaths. Nurturing care as a stable environment that is sensitive to children's health and nutritional needs with protection from threats, opportunities for early learning, and interactions that are responsive emotionally supportive, and developmentally stimulating.

Women are vulnerable to malnutrition for social and biological reasons, throughout, their lifecycle. The Lancet series maternal and nutrition indicates that Undernutrition during pregnancy, affecting fetal growth and the first two years of life is a significant determinant of both stunting of linear growth and subsequent obesity and non-communicable diseases in adulthood(Black R. E. et al., 2013). The nutritional status of women before and during pregnancy is important for healthy pregnancy outcome(Kramer, 1987). A meta-analysis of epidemiological studies indicates that around 60 percent more assisted delivery needed for the lowest quartile of stature as compared with women in the highest quartile(Kelly et al., 1996). Low maternal BMI is associated with intrauterine growth restriction and also the disease burden of low maternal body mass index as a

risk factor for perinatal conditions(Fishman et al., 2004). The concentration of some micronutrients such as Vitamin A, Iodine, thiamine, riboflavin, pyridoxine and cobalamin in breast milk is dependent on maternal status and intake, so the risk of infant depletion is increased by a maternal deficiency(Allen, L., 1994). The prevention of maternal and child undernutrition is a long-term investment that will benefit the present generation and their children(Victora et al., 2008). According to NFHS-4 about 23 and 21 percent women age 15-49 are below normal (BMI < 18.5 kg/m2) and overweight or obesity (BMI ≥ 25.0 kg/m2) respectively(IIPS, 2017).

In recent year the government of India has launched many programme for the improvement of health in children, mothers and adolescent girls (15-49 Years). The programme such as Mothers' Absolute Affection Programme (MAA), a nation-wide programme for promoting breastfeeding was launched by the Honorable Union Minister of Health and Family Welfare on 5th August 2016 in New Delhi. The goal of the 'MAA' programme is to revitalize efforts towards promotion, protection and support of breastfeeding practices though health system to achieve higher breastfeeding rates. The main objectives of the programme to achieve the mentioned goal. (a) Build an enabling environment for breastfeeding through awareness generation activities, targeting pregnant and lactating mothers, family members and society to promote optimal breastfeeding practices, breastfeeding to be positioned as an important intervention for child survival and development. (b) Reinforce lactation support services at public health facilities through trained healthcare providers and through skilled community health workers. (c) To incentivize and recognize those health facilities that show high rates of breastfeeding along with processes in place for lactation management. The other programme National Nutrition Mission (NNM) also focused on children, adolescent girls, and pregnant and lactating mother. The main objectives of this programme are: - 1) To prevent and reduce stunting, underweight, low birth weight in children (0-6 years) @ 2% per annum. 2) To reduce the prevalence of Anaemia among young children (06-59 months) @ 3% per annum. 3)To reduce the prevalence of Anaemia amongst women and Adolescent Girls (15-49 years) @ 3% per annum.

Data sources and Methodology
The present study will use four rounds of National Family Health Survey (NFHS). NFHS provides abundant information on fertility, mortality, and essential aspects of nutrition, health, and healthcare, especially for children aged 0-5 years. The distinctive feature of this survey is the collection of anthropometric measurements of height and weight for children 0-5 and women 15-49. It also provides information on utilization of various intervention programme of women and children aged 0-5 in the household. The leading indicators of children's nutritional status are based on anthropometric measures: height measure in centimetres, weight measured in kilograms and two indices expressed in standard deviation units (z-score) from, the median for height and weight for the latest international reference population released by WHO in 2006(De Onis, Onyango, Borghi, Garza, & Yang, 2006).

Statistical Technique
Here, we want to make the comparisons of outcomes using propensity score between those individuals (women and child) who availed the interventions or those who did not Interventions includes those affecting adolescents, women of reproductive age, pregnant women, new-born babies, infants, and children.

(a) **Interventions in mothers of reproductive age and during pregnancy:** - Folic acid supplementation, Iron or Iron and folic acid supplementation

(b) **Nutrition interventions in infants and children:-** promotion of breastfeeding and supportive strategies, promotion of dietary diversity and complementary feeding, vitamin A supplementation in children(Z. A. Bhutta, Das, Rizvi, et al., 2013)

(c) **Other interventions: -** Supplementary nutrition, Health check-up, and nutrition education.

In 1983, Rosenbaum and Rubin published a seminar paper on propensity score analysis; the paper articulated the theory and application principles for a variety of propensity score models. The Propensity score is the conditional probability of assignment to the particular treatment given a vector of observed covariates. Both large and small sample theory show that adjustment for the scalar propensity score is sufficient to remove bias due to all observed covariates (Rosenbaum & Rubin, 1983).

Let the conditional probability of assignment to treatment one, given the covariates, be denoted by

$$e(X) = Pr(T=1|X)$$

Where, T= {0, 1} is the indicator of exposure to treatment and X is the multidimensional vector of background characteristics. The function e(X) is called the propensity score that is the propensity towards exposure to treatment 1 given the observed covariates X (Rosenbaum & Rubin, 1983). The propensity score is the probability of receiving the treatment T conditional on the covariates X.

The impact of the treatment on the *i*th individual is denoted by δ_i. δ_i is defined as the difference between the potential outcome in the presence of treatment and the potential outcome in the absence of treatment (*i.e.* $\delta_i = Y_{1i} - Y_{0i}$). The evaluation seeks to estimate the mean impact of interventions, obtained by averaging the impact across all individuals in the population, this parameter is known as Average Treatment Effect (**ATE=E(δ) =E ($Y_1 - Y_0$))** Where E (.) represents the average.

Counterfactual model: - The counterfactual approach, which is the part of the casual analysis, has made important inroads into statistical and econometric work. The counterfactual model is constructed for the calculation of average treatment effect. Counterfactual is the potential outcome that would have happened in the absence of the intervention. Average treatment effect on the Treated measures the impact of the treatment on treated individuals (**ATT=E (Y_1|D=1)-E (Y_0|D=1))** Where E (Y_1|D=1) is the average outcome of treated individuals (mother and children) and E (Y_0|D=1) is the counterfactual, it shows an average outcome that the treated individuals (mother and children) would have obtained absence of treatment, which is unobserved. Finally, the average treatment effect on the untreated individuals (mother and children) is measured, which shows the impact of intervention would have had on those who did not avail (**ATU= E (Y_1|D=0)-E (Y_0|D=0)).** Where E (Y_1|D=0) is the average observed outcome for those individuals (mothers and children) did not avail intervention. E(Y_0|D=0) is the counterfactual, and it shows the average outcome for those individual's (mothers and children) who did not avail intervention if they would have obtained in the presence of treatment, which is unobserved. The main aim is to calculate the average treatment effect (ATE). **ATE= E (Y|D=1)-E (Y|D=0) =Δ**

We can write

$$Δ = ATT+ E (Y_0|D=1)-E (Y_0|D=0)$$
$$Δ =ATT, if E (Y_0|D=1) =E (Y_0|D=0$$

Fig.1

Changes in stunted children below age five year during one decade
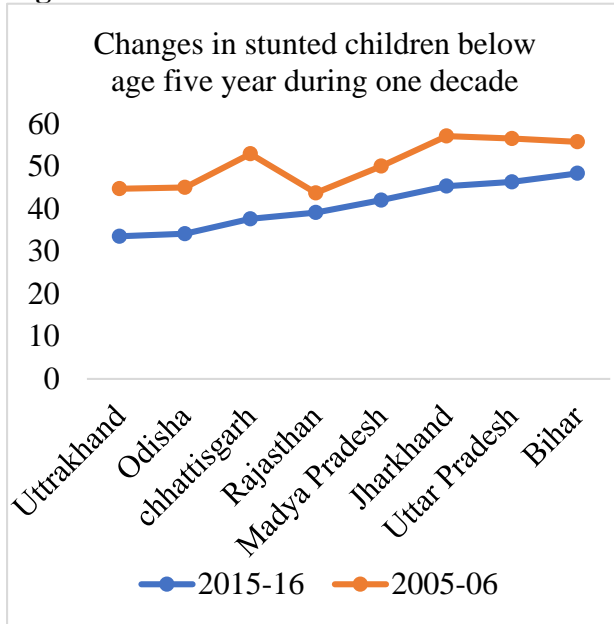
The figure one shows the changes occurred in stunted children during one decade. In India, we know that there are so many problems in implementing the policies and interventions. But now a days lots of improvement occurred during in one decade such as improvement in a medical institution, reduced poverty through various Programmes and policies. In Uttarakhand, the prevalence of stunted children reduced 44.69 percent to 33.5 during one decade. Odisha also shows the reduction in the prevalence of stunted children 45 to 34 percent. Chhattisgarh, Rajasthan, Madya Pradesh Jharkhand, Uttar Pradesh, and Bihar also reduced the prevalence of stunting during one decade. But in Bihar, there is not much improvement than other states.

Fig 2.

The figure two shows the changes occurred during one decade in the prevalence of underweighted children. In these Indian states, we know that there are so many problems in implementing the policies and interventions. In Uttarakhand the prevalence of stunted children reduced by 38.05 percent to 26.6 percent during one decade. Odisha also show the reduction in the prevalence of underweighted children 40 to 34 percent. Chhattisgarh, Rajasthan, Madya Pradesh Jharkhand, Uttar Pradesh and Bihar also reduced the prevalence of underweighted children during one decade. But in case of Jharkhand there are not much improvement than other states

Changes in underweighted children below age five year during one decade
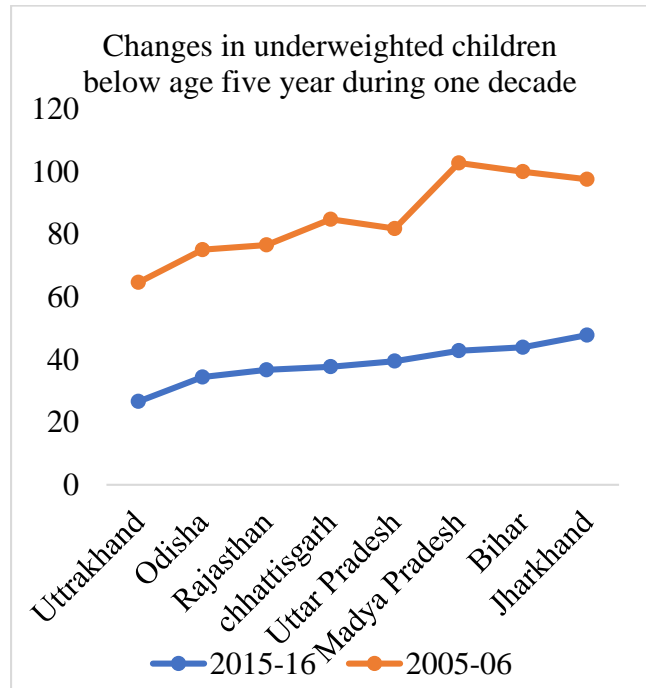
Table 1: Percentage distribution of stunted children under age five years classified as malnourished according to three categories of anthropometric indices by background characteristics, EAG states, India (NFHS-IV, 2015-16)

Background Characteristics	Bihar			Jharkhand			Uttar Pradesh			Uttarakhand		
	Severe	Moderate	Mild	Severe	Moderate	Mild	Severe	Moderate	Mild	Severe	Moderate	Mild
Age												
0-5	19.44	26.68	53.87	20.91	27.54	51.56	22.31	28.41	49.28	28.13	31.25	40.62
6-9	22.83	32.6	44.58	24.83	29.87	45.3	22.18	26.3	51.52	24.16	33.4	42.44
10-12	24.76	29.58	45.66	32.04	28.80	39.16	23.49	30.9	45.61	24.63	29.65	45.72
13-36	34.97	35.23	29.8	31.00	38.00	31.01	32.37	35.8	31.82	25.47	32.74	41.79
37-59	31.96	36.64	31.4	27.88	36.09	36.02	28.7	35.83	35.47	21.37	34.48	44.16
Sex												
Male	32.25	34.41	33.34	30.73	35.04	34.24	29.94	34.36	35.7	24.49	32.77	42.74
Female	31.54	35.79	32.67	27.11	36.82	36.07	28.93	35.27	35.8	22.96	33.87	43.17
Birth Interval												
First Birth	27.9	36.1	36	26.27	35.91	37.82	23.96	35.34	40.71	21.37	31.36	47.28
Less than 24	35.31	33.45	31.24	34.11	34.35	31.54	34.24	34.24	31.53	28.98	33.82	37.2
24-35	33.83	34.69	31.48	30.54	35.41	34.06	32.07	34.92	33.01	23.64	36.53	39.84
36+	31.05	35.97	32.98	28.1	37.12	34.78	29.3	34.54	36.16	23.42	33.05	43.53
Bird Order												
First	27.9	36.09	36.01	26.23	36.05	37.72	23.94	35.35	40.71	21.55	31.57	46.89
2-3	31.39	34.72	33.89	28.23	36.62	35.15	28.43	34.9	36.67	22.6	33.42	43.97
4-5	35.55	35.41	29.03	34.84	34.35	30.81	36.03	34.34	29.63	32.3	35.02	32.68
6+	41.22	32.79	25.99	42.52	30.2	27.28	39.29	33.34	27.37	32.69	42.17	25.14
Size of Child at birth												
Small	36.94	36.58	26.48	30.4	36.52	33.08	32.9	35.88	31.22	29.13	34.42	36.45
Average	30.82	34.91	34.28	28.77	35.92	35.31	28.43	34.84	36.72	22.47	33.17	44.36
Large	31.39	34.35	34.26	29.26	34.84	35.9	30.49	33.03	36.47	24.87	32.92	42.21
Birth weight												
Extremely low birth	0	50.75	49.25	100	0	0	44.37	31.39	24.24	74.31	0	25.69
Very low birth weight	38.43	41.65	19.92	37.02	37.19	25.79	36.86	33.13	30.01	14.76	33.87	51.37
low birth weight	35.34	38.44	26.21	29.35	39.18	31.47	30.13	35.18	34.69	26.96	29.16	43.88
Normal birth weight	31.57	34.74	33.69	28.87	35.54	35.6	29.28	34.77	35.95	23.21	34.1	42.69
Mother's age at the time of birth												
Less than 20 Years	27.68	32.27	40.05	29.16	32.92	37.93	26.93	33.67	39.4	19.1	34.41	46.49
20-29 Years	30.29	35.27	34.44	28.11	36.41	35.48	27.43	35.19	37.38	23.03	32.82	44.15
30 Years and above	35.67	34.9	29.43	31.62	34.84	33.55	33.31	34.07	32.62	25.85	34.14	40.02
Mother's BMI												
Underweight	34.01	35.85	30.14	30.54	37.22	32.24	34.33	35.19	30.48	27.66	34.8	37.54
Normal	31.74	34.81	33.44	29.07	35.15	35.77	29.34	34.72	35.94	24	32.79	43.21
Overweight	20.8	33.84	45.36	15.37	34.47	50.16	20.26	34.66	45.08	18.8	34.19	47.02

Obesity	24.4	34.53	41.07	20.25	32.42	47.33	17.58	33.07	49.35	15.07	31.45	53.49
Mother's education												
Illiterate	37.01	34.68	28.31	35.56	36.05	28.4	36.04	34.28	29.67	30.96	35.75	33.29
Primary	29.2	37.97	32.82	30.56	34.38	35.06	29.64	35.41	34.95	27.49	34.63	37.88
secondary	22.57	34.73	42.71	22.82	36.98	40.2	22.57	35.85	41.58	19.9	33.13	46.96
Higher	16.28	33.5	50.23	18.77	29.31	51.93	16.31	32.38	51.31	18.38	27.52	54.1
Place of Residence												
Urban	24.29	36.77	38.94	22.32	33.29	44.39	23.75	34.52	41.72	23.36	34.42	42.23
Rural	32.69	34.91	32.39	30.31	36.41	33.28	30.79	34.85	34.36	23.94	32.79	43.27
Caste												
SC/ST	36.5	35.21	28.29	32.16	36.4	31.44	33.28	35.36	31.36	24.24	33.78	41.98
OBC	30.42	35.4	34.19	27.58	35.56	36.86	28.9	35.03	36.07	26.19	33.83	39.97
others	29.09	32.94	37.97	22.21	34.74	43.05	24.14	33.02	42.84	20.95	32.17	46.87
Religion												
Hindu	31.31	35.57	33.11	28.5	36.55	34.95	29.61	34.97	35.43	23.6	32.6	43.8
Muslim	34.53	32.87	32.6	29.09	32.52	38.39	29.01	34.26	36.73	24.81	36.17	39.02
Others	35.26	42.14	22.6	29.22	33.5	37.28	11.76	16.81	71.42	15.05	27.9	57.04
Wealth Index												
Poorest	36.71	34.66	28.63	33.77	36.53	29.7	38.62	33.75	27.63	42.71	31.87	25.42
Poorer	27.76	36.4	35.84	27.01	36.1	36.88	29.74	36.27	34	26.23	33.76	40.01
Middle	20.63	36.26	43.11	22.92	36.93	40.16	24.41	35.91	39.67	26.18	36.86	36.96
Richer	18.34	32.58	49.08	16.3	33.36	50.34	19.93	35.42	44.65	17.21	34.19	48.61
Richest	16.66	32.06	51.28	17.97	26.31	55.72	15.47	31.53	53	19.81	26.83	53.36
Household Environment variable												
Type of house												
Kuccha	36.4	35.84	27.76	40.73	39.38	19.89	38.86	32.27	28.87	30.89	31.62	37.49
Semi-Pucca	33.11	34.97	31.92	31.4	36.28	32.32	31.43	35.09	33.49	24.7	36.02	39.28
Pucca	23.05	34.77	42.17	22.1	34.59	43.31	22.06	34.68	43.26	22.1	32.09	45.81
Toilet facility												
Improved	22.79	35.65	41.56	20.06	34.26	45.68	22.52	35.08	42.4	21.49	33.83	44.68
Not Improved	34.9	34.96	30.14	31.44	36.42	32.14	34.2	34.65	31.16	31.13	31.38	37.48
Fuel used for cooking												
With smoke	33.39	35.25	31.36	30.12	36.49	33.38	32.45	34.96	32.58	25.22	34.05	40.73
Without smoke	19.89	33.85	46.26	19.76	31.13	49.11	21.31	34.24	44.45	20.65	32.13	47.23
Source of drinking water												
Improved	32.11	35.07	32.82	28.56	36.17	35.27	29.82	34.94	35.24	23.35	33.13	43.52
Unimproved	30.49	37.42	32.09	30.6	35.36	34.04	29.34	30.45	40.21	25.08	35.44	39.48
Total	**31.90**	**35.09**	**33.01**	**28.99**	**35.89**	**35.12**	**29.46**	**34.79**	**35.75**	**23.76**	**33.30**	**42.94**

Note: Mild = -2SD=Z score <-1SD; Moderate= -3SD= Z score < -2SD; Severe = Z score <-3SD

Continue….

Background Characteristics	Madhya Pradesh			Chhattisgarh			Odisha			Rajasthan		
	Severe	Moderate	Mild	Severe	Moderate	Mild	Severe	Moderate	Mild	Severe	Moderate	Mild
Age												
0-5	22.82	25.08	52.09	35.64	25.56	38.8	28.28	28.22	43.5	27.23	26.13	46.65
6-9	21.34	29.28	49.38	22.33	34.23	43.44	16.2	26.94	56.86	25.84	26.4	47.77
10-12	28.57	31.65	39.78	24.41	27.02	48.57	22.94	34.36	42.7	26.78	26.78	46.44
13-36	30.4	34.62	34.98	25.73	34.15	40.12	22.85	34.98	42.17	28.04	33.2	38.76
37-59	25.54	36.16	38.3	18.51	33.29	48.2	15.06	36.13	48.82	24.45	34.9	40.66
Sex												
Male	28.15	34.22	37.63	25.29	33.18	41.53	21.38	33.48	45.15	27.56	32.44	40
Female	26.59	34.76	38.64	21.52	32.21	46.28	17.56	36.07	46.37	24.85	33.56	41.59
Birth Interval												
First Birth	24.77	34.46	40.77	23.6	33.27	43.13	18.42	32.85	48.73	24.15	31.73	44.12
Less than 24	33.31	34.23	32.46	22.78	33.74	43.48	24.87	36.58	38.55	30.31	32.93	36.76
24-35	28.48	35.6	35.92	22.19	32.12	45.69	21.89	37.2	40.91	28.49	33.79	37.72
36+	24.75	33.49	41.76	24.7	31.77	43.53	18.28	35.37	46.36	23.76	34	42.23
Bird Order												
First	24.77	34.48	40.74	23.63	33.19	43.17	18.37	32.84	48.79	24.04	31.78	44.18
2-3	27.72	34.06	38.22	23.67	31.32	45	19.78	35.63	44.59	25.65	33.98	40.36
4-5	32.04	35.95	32.01	22.97	36.5	40.53	22.34	36.72	40.94	31.34	32.62	36.05
6+	34.03	35.12	30.86	17.19	38.5	44.31	22.2	41.59	36.21	34.42	32.16	33.42
Size of Child at birth												
Small	33.59	34.02	32.39	29.71	35.54	34.75	23.41	36.92	39.67	34.49	30.62	34.89
Average	25.99	34.76	39.24	23.53	32.22	44.25	18.96	34.64	46.39	24.73	33.15	42.11
Large	27.78	33.56	38.66	18.87	32.54	48.59	18.23	33.11	48.66	27.21	34.66	38.12
Birth weight (gram)												
Extremely low birth	26.02	24.78	49.2	3.14	49.54	47.33	0	27.97	72.03	54.99	41.55	3.46
Very low birth weight	34.94	36.1	28.96	27.1	34.46	38.44	30.23	36.8	32.97	35.37	26.79	37.83
low birth weight	31.33	34.79	33.88	29.18	35.74	35.08	26.06	36.18	37.76	27.53	36.3	36.16
Normal birth weight	26.48	34.41	39.11	22.76	32.32	44.92	17.64	34.33	48.03	25.9	32.35	41.75
Mother's age at birth												
Less than 20 Years	30.3	31.48	38.21	28.62	31.03	40.34	25.23	33.33	41.44	24.9	26.75	48.36
20-29 Years	27.18	34.76	38.05	23.65	31.85	44.5	19.36	34.17	46.46	26.42	33.13	40.45
30 Years and above	27.97	33.76	38.26	22.42	35.45	42.12	19.29	36.19	44.52	25.96	33.09	40.95
Mother's BMI												
Underweight	28.43	35.47	36.1	23.12	35.96	40.92	24.66	35.73	39.61	30.43	33.15	36.41
Normal	27.67	34.17	38.15	24.37	31.41	44.22	18.07	35.82	46.1	24.87	33.36	41.77
Overweight	21.23	32.37	46.39	14.34	33.86	51.8	12.65	26.55	60.8	21.38	30.9	47.73
Obesity	17.71	33.35	48.95	21.1	16.29	62.61	7.64	17.14	75.22	22.54	24.73	52.73

Mother's education

Illiterate	34.21	34.35	31.44	27.16	34.96	37.88	26.55	37.19	36.26	30.68	33.75	35.57
Primary	26.98	35.91	37.11	24.09	33.37	42.53	18.69	35.16	46.15	25.92	33.18	40.9
secondary	22.79	34.52	42.7	22.11	30.61	47.27	14.93	33.64	51.43	21.24	32.7	46.06
Higher	17.31	29.36	53.33	15.64	37.96	46.41	19.39	23.95	56.66	19.87	28.13	52
Place of Residence												
Urban	24.35	33.31	42.34	17	34.94	48.06	20.18	29.87	49.95	22.96	31.46	45.58
Rural	28.42	34.87	36.71	24.95	32.18	42.87	19.42	35.46	45.13	27.12	33.33	39.55
Caste												
SC/ST	31.72	35.25	33.03	26.18	32.28	41.54	22.91	36.36	40.73	30.96	33.48	35.56
OBC	25.05	34.5	40.45	21.6	32.52	45.89	16.19	34.28	49.53	23.77	32.87	43.36
others	20.34	31.76	47.89	14.32	37.3	48.39	13.27	28.38	58.34	20.95	31.59	47.46
Religion												
Hindu	27.55	34.67	37.78	23.64	32.88	43.48	19.61	34.6	45.8	26.05	33.04	40.91
Muslim	25.82	33.2	40.99	21.52	29.47	49.01	15.98	43.55	40.47	28.6	33.16	38.24
Others	24.07	19.39	56.54	13.26	26.16	60.58	17.55	34.11	48.34	24.28	26.19	49.53
Wealth Index												
Poorest	32.47	34.63	32.9	29.07	32.08	38.85	24.13	36.9	38.97	34.99	32.6	32.42
Poorer	28.66	35.52	35.82	24.41	33.77	41.82	17.67	35.93	46.4	28.76	33.48	37.76
Middle	21.67	37.83	40.5	21	33.47	45.52	14.46	31.08	54.46	22.4	35.07	42.52
Richer	23.83	31.97	44.19	13.87	33.49	52.63	12.29	29.06	58.65	19.54	32.94	47.52
Richest	19.92	29.3	50.77	16.76	29.45	53.78	15.34	27.08	57.58	20.89	28.95	50.16
Type of house												
Kuccha	35.77	31.58	32.65	29.88	35.04	35.08	20.43	36.54	43.03	32.74	32.38	34.88
Semi-Pucca	29.27	35.06	35.68	26.29	32.37	41.33	22.39	35.92	41.68	30.85	33.36	35.79
Pucca	22.67	33.42	43.9	17.19	33.18	49.63	15.11	31.61	53.28	22.87	32.81	44.32
Toilet facility												
Improved	22.34	32.96	44.7	18.27	33.3	48.43	14.01	31.77	54.22	22.26	32.29	45.45
Not Improved	30.19	35.23	34.58	25.92	32.1	41.97	21.18	36.3	42.52	29.82	33.66	36.51
Fuel used for cooking												
With smoke	28.98	35.13	35.89	24.4	32.62	42.98	20.09	35.97	43.93	28.31	33.34	38.35
Without smoke	22.74	32.13	45.14	17.62	32.16	50.22	14.23	29.56	56.21	20.96	32.18	46.86
Source of drinking water												
Improved	27.43	34.48	38.09	23.26	32.33	44.41	19.4	35.22	45.39	26.56	33.16	40.27
Unimproved	28.45	34.29	37.26	23.22	34.51	42.26	19.2	35.07	45.73	26.98	32.66	40.36
Total	**27.41**	**34.48**	**38.11**	**23.44**	**32.70**	**43.85**	**19.51**	**34.74**	**45.74**	**26.31**	**32.96**	**40.73**

Note: Mild = -2SD=Z score <-1SD; Moderate= -3SD= Z score < -2SD; Severe = Z score <-3SD

Table 2: Results of matching estimates showing the effect of intervention Programmes on stunted children below age five Year by their mother's background characteristics States, India

Mother received supplementary during pregnancy							Mother receive supplementary while breastfeeding						
Bihar							**Bihar**						
	Treated	Controls	Difference	S.E.	C I			Treated	Controls	Difference	S.E.	C I	
					Lower	Upper						Lower	Upper
Unmatched	0.529	0.478	0.051	0.015			Unmatched	0.525	0.486	0.039	0.019		
ATT	0.529	0.477	0.052	0.021	-0.041	0.043	ATT	0.525	0.530	-0.005	0.026	-0.052	0.051
ATU	0.478	0.530	0.052	.			ATU	0.486	0.494	0.008	.		
ATE			0.052	.			ATE			-0.003	.		
Jharkhand							**Jharkhand**						
Unmatched	0.472	0.454	0.018	0.035			Unmatched	0.468	0.475	-0.007	0.040		
ATT	0.472	0.435	0.037	0.048	-0.093	0.096	ATT	0.468	0.493	-0.025	0.057	-0.114	0.111
ATU	0.454	0.401	-0.053	.			ATU	0.475	0.432	-0.043	.		
ATE			0.034	.			ATE			-0.026	.		
Uttar Pradesh							**Uttar Pradesh**						
Unmatched	0.485	0.460	0.025	0.013			Unmatched	0.487	0.427	0.060	0.018		
ATT	0.485	0.455	0.030	0.019	-0.037	0.038	ATT	0.487	0.490	-0.002	0.026	-0.050	0.050
ATU	0.460	0.473	0.013	.			ATU	0.427	0.452	0.025	.		
ATE			0.028	.			ATE			0.000	.		
Uttarakhand							**Uttarakhand**						
Unmatched	0.325	0.368	-0.044	0.077			Unmatched	0.316	0.429	-0.112	0.102		
ATT	0.325	0.394	-0.070	0.134	-0.273	0.254	ATT	0.316	0.563	-0.246	0.146	-0.322	0.250
ATU	0.368	0.237	-0.132	.			ATU	0.429	0.238	-0.190	.		
ATE			-0.071	.			ATE			-0.246	.		
Madhya Pradesh							**Madhya Pradesh**						
Unmatched	0.431	0.385	0.046	0.034			Unmatched	0.432	0.373	0.059	0.040		
ATT	0.431	0.422	0.009	0.046	-0.089	0.090	ATT	0.432	0.401	0.030	0.064	-0.124	0.128
ATU	0.385	0.394	0.009	.			ATU	0.373	0.418	0.046	.		
ATE			0.009	.			ATE			0.031	.		
Chhattisgarh							**Chhattisgarh**						
Unmatched	0.392	0.430	-0.038	0.048			Unmatched	0.391	0.333	0.058	0.052		
ATT	0.392	0.435	-0.043	0.092	-0.184	0.176	ATT	0.391	0.295	0.096	0.077	-0.143	0.158
ATU	0.430	0.346	-0.084	.			ATU	0.333	0.433	0.100	.		
ATE			-0.044	.			ATE			0.096	.		
Rajasthan							**Rajasthan**						
Unmatched	0.415	0.364	0.051	0.020			Unmatched	0.415	0.369	0.046	0.030		
ATT	0.415	0.364	0.052	0.026	-0.050	0.053	ATT	0.415	0.409	0.005	0.041	-0.079	0.080
ATU	0.364	0.393	0.029	.			ATU	0.369	0.362	-0.007	.		
ATE			0.049	.			ATE			0.005	.		
Odisha													
Unmatched	0.367	0.209	0.158	0.074									
ATT	0.367	0.200	0.167	0.130	-0.233	0.276							
ATU	0.209	0.279	0.070	.									
ATE			0.166	.									

Continue……...

Mother received Health checkups during pregnancy							Mother received health checkup while breastfeeding						
Bihar							**Bihar**						
	Treated	**Controls**	**Difference**	**S.E.**	**C I**			**Treated**	**Controls**	**Difference**	**S.E.**	**C I**	
					Lower	**Upper**						**Lower**	**Upper**
Unmatched	0.524	0.515	0.009	0.011			Unmatched	0.518	0.526	-0.008	0.011		
ATT	0.524	0.522	0.002	0.016	-0.031	0.031	ATT	0.518	0.529	-0.011	0.016	-0.032	0.031
ATU	0.515	0.525	0.010	.			ATU	0.526	0.545	0.019	.		
ATE			0.004	.			ATE			0.002	.		
Jharkhand							**Jharkhand**						
Unmatched	0.460	0.500	-0.039	0.014			Unmatched	0.460	0.481	-0.020	0.013		
ATT	0.460	0.491	-0.031	0.018	-0.037	0.036	ATT	0.460	0.468	-0.008	0.019	-0.036	0.036
ATU	0.500	0.473	-0.027	.			ATU	0.481	0.484	0.003	.		
ATE			-0.030	.			ATE			-0.003	.		
Uttar Pradesh							**Uttar Pradesh**						
Unmatched	0.471	0.497	-0.026	0.009			Unmatched	0.470	0.494	-0.024	0.010		
ATT	0.471	0.479	-0.007	0.013	-0.025	0.025	ATT	0.470	0.471	-0.001	0.014	-0.028	0.028
ATU	0.497	0.494	-0.004	.			ATU	0.494	0.495	0.000	.		
ATE			-0.006	.			ATE			0.000	.		
Uttarakhand							**Uttarakhand**						
Unmatched	0.322	0.328	-0.005	0.018			Unmatched	0.340	0.326	0.013	0.018		
ATT	0.322	0.335	-0.013	0.027	-0.054	0.053	ATT	0.340	0.329	0.011	0.026	-0.050	0.050
ATU	0.328	0.324	-0.004	.			ATU	0.326	0.345	0.019	.		
ATE			-0.008	.			ATE			0.015	.		
Madhya Pradesh							**Madhya Pradesh**						
Unmatched	0.428	0.446	-0.017	0.014			Unmatched	0.430	0.438	-0.008	0.013		
ATT	0.428	0.451	-0.023	0.019	-0.037	0.036	ATT	0.430	0.442	-0.012	0.018	-0.035	0.035
ATU	0.446	0.427	-0.019	.			ATU	0.438	0.470	0.032	.		
ATE			-0.022	.			ATE			-0.005	.		
Chhattisgarh							**Chhattisgarh**						
Unmatched	0.395	0.363	0.032	0.021			Unmatched	0.395	0.374	0.021	0.016		
ATT	0.395	0.380	0.015	0.028	-0.054	0.055	ATT	0.395	0.405	-0.011	0.021	-0.042	0.042
ATU	0.363	0.370	0.007	.			ATU	0.374	0.411	0.037	.		
ATE			0.015	.			ATE			-0.003	.		
Rajasthan							**Rajasthan**						
Unmatched	0.411	0.408	0.003	0.015			Unmatched	0.415	0.405	0.010	0.015		
ATT	0.411	0.394	0.017	0.020	-0.039	0.040	ATT	0.415	0.392	0.023	0.020	-0.039	0.040
ATU	0.408	0.418	0.010	.			ATU	0.405	0.436	0.031	.		
ATE			0.015	.			ATE			0.025	.		
Odisha							**Odisha**						
Unmatched	0.350	0.340	0.010	0.024			Unmatched	0.352	0.352	0.000	0.022		
ATT	0.350	0.381	-0.030	0.032	-0.064	0.062	ATT	0.352	0.358	-0.006	0.030	-0.059	0.059
ATU	0.340	0.296	-0.044	.			ATU	0.352	0.324	-0.027	.		
ATE			-0.031	.			ATE			-0.008	.		

Continue…….

Mother received health and nutrition education during pregnancy							Mother received health and nutrition education while breastfeeding						
Bihar							**Bihar**						
	Treated	**Controls**	**Difference**	**S.E.**	**C I**			**Treated**	**Controls**	**Difference**	**S.E.**	**C I**	
					Lower	**Upper**						**Lower**	**Upper**
Unmatched	0.515	0.527	-0.012	0.011			Unmatched	0.522	0.521	0.001	0.011		
ATT	0.515	0.526	-0.011	0.016	-0.031	0.030	ATT	0.522	0.539	-0.017	0.016	-0.032	0.032
ATU	0.527	0.521	-0.006	.			ATU	0.521	0.548	0.027	.		
ATE			-0.009	.			ATE			0.006	.		
Jharkhand							**Jharkhand**						
Unmatched	0.468	0.478	-0.010	0.013			Unmatched	0.465	0.474	-0.009	0.013		
ATT	0.468	0.480	-0.012	0.018	-0.035	0.034	ATT	0.465	0.472	-0.007	0.018	-0.036	0.036
ATU	0.478	0.471	-0.007	.			ATU	0.474	0.475	0.001	.		
ATE			-0.010	.			ATE			-0.003	.		
Uttar Pradesh							**Uttar Pradesh**						
Unmatched	0.466	0.492	-0.026	0.009			Unmatched	0.465	0.493	-0.028	0.010		
ATT	0.466	0.477	-0.011	0.013	-0.025	0.025	ATT	0.465	0.505	-0.039	0.015	-0.029	0.028
ATU	0.492	0.490	-0.002	.			ATU	0.493	0.468	-0.025	.		
ATE			-0.006	.			ATE			-0.031	.		
Uttarakhand							**Uttarakhand**						
Unmatched	0.337	0.315	0.023	0.018	-0.035	0.036	Unmatched	0.342	0.325	0.017	0.018		
ATT	0.337	0.318	0.019	0.026	-0.050	0.051	ATT	0.342	0.336	0.007	0.025	-0.049	0.049
ATU	0.315	0.355	0.040	.			ATU	0.325	0.366	0.041	.		
ATE			0.030	.			ATE			0.026	.		
Madhya Pradesh							**Madhya Pradesh**						
Unmatched	0.427	0.441	-0.013	0.011			Unmatched	0.430	0.434	-0.004	0.011		
ATT	0.427	0.436	-0.008	0.015	-0.029	0.029	ATT	0.430	0.437	-0.007	0.015	-0.030	0.030
ATU	0.441	0.454	0.013	.			ATU	0.434	0.444	0.010	.		
ATE			-0.004	.			ATE			-0.003	.		
Chhattisgarh							**Chhattisgarh**						
Unmatched	0.398	0.354	0.044	0.019			Unmatched	0.392	0.385	0.008	0.016		
ATT	0.398	0.346	0.052	0.026	-0.049	0.051	ATT	0.392	0.370	0.023	0.023	-0.044	0.045
ATU	0.354	0.386	0.032	.			ATU	0.385	0.391	0.006	.		
ATE			0.050	.			ATE			0.020	.		
Rajasthan							**Rajasthan**						
Unmatched	0.406	0.417	-0.011	0.012			Unmatched	0.405	0.422	-0.016	0.014		
ATT	0.406	0.414	-0.008	0.017	-0.033	0.033	ATT	0.405	0.435	-0.030	0.019	-0.038	0.036
ATU	0.417	0.419	0.003	.			ATU	0.422	0.403	-0.019	.		
ATE			-0.004	.			ATE			-0.025	.		
Odisha							**Odisha**						
Unmatched	0.352	0.326	0.026	0.019			Unmatched	0.351	0.354	-0.003	0.019		
ATT	0.352	0.339	0.013	0.025	-0.049	0.050	ATT	0.351	0.345	0.006	0.025	-0.049	0.049
ATU	0.326	0.366	0.040	.			ATU	0.354	0.372	0.017	.		
ATE			0.016	.			ATE			0.007	.		

Result: - The table 1 given below represents the percentage distribution of children under five years of age categorized into three important indices severe, moderate and mild. Despite of impressive economic growth India's mothers and children still facing a problem with health and nutrition status. This study is mainly focused on those Indian states which are very backward in health and nutritional status named Empowered Action Group states (EAG). These states are Bihar, Jharkhand, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Odisha, and Rajasthan. In these states the prevalence of severe, moderate and mild stunted children determined by their mothers' characteristics. In all states the prevalence of severely stunted children is higher among underweighted mothers, it means mother nutrition status highly impact on their children nutritional status. Children birth weight, Birth interval, Birth order, and Birth size at the time of born also showing the higher contribution on children nutritional status. Mothers those who have not completed the schooling education, the prevalence of severely stunted children are also higher than more educated women. In EAG states the girl's participation in education sectors is very few. If women are illiterate, then they are not aware of any schemes related to health and nutrition. Poverty is also a leading cause of the bad health condition. In these states because poverty about 30 percent children suffers from severe stunting. Also, they cannot avail good medicines facility, Health care services due to poverty.

Matching estimates examine the association between mothers received services during pregnancy, while breastfeeding and child nutritional status shown in table 2. In Bihar, the unmatched samples estimate show that the difference in HAZ for services received or services not received is 0.009. This indicates that the prevalence of stunted children is higher in those mothers who have received health checkups during pregnancy than those who have not received the health checkups during pregnancy. It is clearly showing that the treatment has a no impact on the children nutritional status treatment given during pregnancy. But in the case of supplementary received while breastfeeding indicates positive impact. In Jharkhand, there is also a very few impacts on the nutritional status of children mother received supplementation. In all states, results are showing very less impact of services availed by mother on the nutritional status of children during pregnancy but in case of services availed by mother while breastfeeding indicates positive impact. Madhya Pradesh, Uttarakhand, Chhattisgarh, and Rajasthan are showing some positive impact on child nutritional status; whomsoever mother availed the supplementation during pregnancy and while breastfeeding. Madhya Pradesh, Uttarakhand, Chhattisgarh, and Rajasthan are showing some positive impact on child nutritional status; whomsoever mother availed the supplementation during pregnancy and while breastfeeding. The difference in HAZ for health and nutritional education received during pregnancy and while breastfeeding is -0.011 and -0.017 respectively in Bihar. Which indicates there is the negative impact of programme. The differences of ATT (Average Treatment Effect on Treated) in Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Rajasthan, and Odisha are -0.011, 0.019, -0.008, -0.008, 0.052, -0.008 and 0.013 services received during pregnancy by mother respectively. The differences of ATT (Average Treatment Effect on Treated) in Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Rajasthan, and Odisha are -0.039, 0.007, -0.007, 0.023, -0.030 and 0.006 services received while breastfeeding by mother.

Discussion and conclusion: - The paper is mainly focused on the nutritional status of children and mothers and children in EAG states. The above result shows that their interventions programme such as supplementary, health checkups and nutrition education during pregnancy have not much impact on their nutrition of children. But the intervention programme such as supplementary while breastfeeding has a positive impact on mother nutritional status and children health and nutritional status. Many kinds of literature show that there are very few impacts of supplementation during pregnancy on the nutrition status of children. In EAG states there are many intervention programmes launched by the government for reduction of malnutrition such as National Nutrition Mission (NNM), Mother Absolute Affection programme for improvement of breastfeeding, Poshan Abhiyan, Integrated Child Development Programme, etc. Integrated Child and Development Programme (ICDS) provides many services for a reduction in malnutrition of children and mothers. The study is mainly focused on ICDS intervention and NRHM based programme. The limitation of the study is the lack of information about many Programmes such as NNM, MAA, and Poshan Abhiyan. Because these are newly launched by the Indian government.

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