

Study on Determinants of Malnutrition in India

By

Monika Singh

Dissertation submitted in partial fulfillment of the requirements of the degree

MBA Hospital and Health Management

Academic year, 2018-2020



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CERTIFICATE

COMPLETION OF DISSERTATION

This certificate is awarded to

Dr Monika Singh

In recognition of having successfully completed her
internship in the department of

HEALTH – Bihar Technical Support Program

and has successfully completed her Project on

"A Study on Determinants of Malnutrition in India"

5th Feb 2020 to 4th May 2020

CARE India, Bihar

She comes across as a committed, sincere & diligent person who has a strong drive &
zeal for learning.

We wish her all the best for future endeavours.


Deputy Director-Human Resources

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **A Study on Determinants of Malnutrition in India** submitted by **Dr. Monika Singh**, Enrollment No: **IIHMR-U/01/2018-20/0777** under the supervision of **Dr. Piyusha Majumdar** for award of **MBA in Hospital and Health Management** of the University carried out during the period from **2020** to **2020** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.

Dr. Monika Singh

MBA-Hospital & Health Management

ABSTRACT

Background

People need a variety of foods to meet requirements for essential nutrients, and the value of a diverse diet has long been recognized. Nutrition's importance as a foundation for healthy child developments is underestimated. Poor nutrition's leads to ill health which further leads to deterioration of health and mental growth. These effects are mostly found in infants and young children who suffer the highest risk of disability and death associated with it. We aimed to determine the burden of NRC's and various determinants of malnutrition.

Methodology

This study utilized data extracted from Ministry of Health & Family Welfare & National Family & Health Survey-4. Descriptive were obtained for independent variables with malnutrition being dependent. Logistic regression was used to obtain the measure of association adjusted for confounders. STATA was used for performing statistical analysis.

Results

Significant associations were found between stunting, wasting & underweight of children with Wash practices, mother's education status, place of residence, BMI of the mother, low birth weight of the child, etc.

Conclusion

Our study concludes that Wash practices, Mother's BMI, birth weight of the child to be the strong predictors for child nutrition. Government officials need to identify gaps in the current on-going nutritional programs and work on it with the help of experts in public health.

Key Words

Stunted, Wasted, Underweight, Malnutrition, Under 5 Children

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LIST OF ABBREVIATIONS

AIIMS	All India Institute of Medical Sciences
ANC	Antenatal Care
ASHA	Accredited Social Health Activist
AWW	Anganwadi Workers
BMI	Body Mass Index
DHS	Demographic & Health Survey
IIPS	International Institute of Population Sciences
MBA	Master's in Business Administration
MoHFW	Ministry of Health & Family Welfare
MS Excel	Microsoft Excel
NFHS	National Family & Health Survey
NRC	Nutritional Rehabilitation Center
NHM	National Health Mission
NRHM	National Rural Health Mission
NUHM	National Urban Health Mission
STATA	Syllabic abbreviation of the words statistics & data
WASH	Water Sanitation & Hygiene

INTRODUCTION

All people need a variety of foods to meet requirements for essential nutrients, and the value of a diverse diet has long been recognized. Lack of diversity is a particularly severe problem among poor populations in the developing world, where diets are based predominantly on starchy staples and often include few or no animal products and only seasonal fruits and vegetables. For vulnerable infants and young children, the problem is particularly critical because they need energy- and nutrient-dense foods to grow and develop both physically and mentally and to live a healthy life. For these reasons, dietary diversity is now included as a specific recommendation in the recently updated guidance for complementary feeding of the breast-fed child aged 6 to 23 months.^{1,2}

Maternal nutritional status is a proximate determinant of a child's nutritional status and should be considered in programmes aiming at improving child health³. Birth weight has a strong negative effect on subsequent weight gain. The effect becomes even more negative (indicating almost complete catch-up by age one) when birth weight is treated as an endogenous variable⁴.

Nutritional deficiencies contribute to high rates of disability, illness and death. They also affect the long-term physical growth and development of children and may lead to high levels of chronic illness and disability in adult life. In addition, high rates of malnutrition jeopardize future economic growth by reducing the intellectual and physical potential of the entire population⁵.

Families with greater incomes and resources tend to have more diverse diets, but they are also likely to have better access to health care, and better environmental conditions. Clearly, children in wealthier households are better off and grow better for a number of reasons, but improved nutrient adequacy may be one important way in which household wealth and resources translate into better outcomes for children. Thus, a key question is whether dietary diversity is independently associated with better child nutritional status because it accurately reflects nutrient adequacy, or whether the association is found primarily because dietary diversity is a particularly good proxy for household socioeconomic status.

In this study, we use nationally representative household surveys from NFHS-4 and comparable measures across years to examine the role of multiple household, community,

and regional socioeconomic and environmental variables in childhood undernutrition in India.

REVIEW OF LITERATURE

Literature 1

(Jelliffe DB, World Health Organization. The assessment of the nutritional status of the community (with special reference to field surveys in developing regions of the world. World Health Organization; 1966.)

Anthropometry is considered to be an important tool of for assessing Growth and nutritional status. Nutritional anthropometry concern with the measurement of the various physical dimensions and the gross composition of the human body at different age. It gives valuable information covering certain types of malnutrition in which body size and gross body composition are affected . Knowledge of the nutritional status of a community is necessary to have a comprehensive idea about its development process, as undernutrition is one of the major health problems in the developing countries.

Literature 2

(Mitra A. The nutrition situation in India. Nutrition and Development. 1985:142-62.)

It was reported that the basic causes of undernutrition or malnutrition in developing countries are poverty, poor hygienic conditions and little access to preventive health care . Inadequacies in nutritional intake or under nutrition can be considered as a major source of many adverse effects on the growth and development of individual. A number of growth studies were carried out in different part of our country from 1960's onward Udani (1963), Ghai et al. (1970), Kaul (1971), Agrawal and Sen (1974), Katiyar et al (1978), Shinde et al. (1989), Mathur et al (1972) were made significant contribution in this field.

Literature 3

(Khongsdier R. Body mass index and morbidity in adult males of the War Khasi in Northeast India. European Journal of Clinical Nutrition. 2002 Jun;56(6):484-9.)

This studied Khasi Children of Meghalaya to find out the growth patterns he described that the girls begin their adolescent growth spurt at the age of 10 and gain the maximum growth velocity of 3.25 cm at 12 years of age. The maximum gains in fat occur at the age of 13 years. There are numbers of studies on the effect of socio- economic status on

human growth (Pagliane 1876; Baneditct 1877, 1879 and 1891; Meredith 1941 and 1951; Hopkins 1947; Tanner 1962).

Literature 4

(Gautam S, Awasthi P. *Nutrient composition and physico-chemical characteristics of Aloe vera (Aloe barbadensis) powder. Journal of Food Science and Technology-Mysore. 2007 Mar 1;44(2):224-5.*)

It provided comparative information with the conclusion that people in the upper socio-economic status are more advanced at all age levels along the course of maturity. It is reported that the most important of all the environmental factor is nutrition (Jelleife and Jelliffe 1960; Garn an Rehman 1966; Rao and Singh 1971; Rao and Rao 1975; Choudhary 1975) which effect growth in human being. In the growing human body, the multiplication of cells or their enlargement in size depend upon adequate supply of energy, amino acids, lipids, vitamins and minerals.

Literature 5

(Jacobson EL, Nunbhakdi-Craig V, Smith DG, Chen HY, Wasson BL, Jacobson MK. *ADP-ribose polymer metabolism: implications for human nutrition. In ADP-ribosylation reactions 1992 (pp. 153-162). Springer, New York, NY.*)

It found an association between change in dietary practices and growth in Japan. He found an association between milk composition and increased growth in biacromian. The influence of heredity on the growth and development of individual child was addressed by Bock (1985), he believes that tallness is a genetically determined characteristic and is being inherited from parents to offspring. Generational changes have been observed in the body size and other developmental features of children at all ages during the period of growth, (of 1940 and 1941; Meredith 1941 and 1963; Damon 1965 and 1968; Miller 1970).

Literature 6

(Dabbs GR. *Health and nutrition at prehistoric Point Hope, Alaska: application and critique of the Western Hemisphere Health Index. University of Arkansas; 2009.*)

It has found the children to be maturing earlier, growing taller and heavier with successive generations. Anthropometric measurements like stature, sitting height, weight and indices based on these measurements like body mass index (BMI) have been extensively used to

define the extent of malnutrition. Boas (1911), Guthe (1918) and various other workers have shown that there were changes in head length and head breadth with increasing age. Fischer (1936) stated that with increase in height the skull becomes somewhat more elongated. Height of an individual is partly conditioned by nutrition and other factors during growth this may result in the increase or decrease of cephalic index corresponding to the increase or decrease in height. Aykroyed (1938) described the importance of the measurement of the arm, chest and hip circumference to direct malnutrition.

Literature 7

(Campbell JL, Cutting WA, Elton RA, Minton EJ, Spreng J. The portable Nabarro weight-height anthropometric nutrition assessment chart. A field trial in three countries in Africa. Transactions of the Royal Society of Tropical Medicine and Hygiene. 1985 Jan 1;79(3):409-11.)

They concluded from their study that anthropometric assessment is a valuable approach to the identification of the acutely malnourished children. Recently in India, the study of Nutrition and growth has attracted the attention of research workers. There were some sporadic attempts to study growth changes in body size as part of diet and nutrition surveys and are reported in the findings of Aykroyed and Raj Gopal (1936), Aykroyed and Krishnah (1937), Aykroyed et al (1938), Wilson et al (1937), Narinder Singh (1939), Shourie (1939), Mitra(1940), Bhawe (1941), Wilson and Widdeneson (1942), Rao et al (1954) and Several others.

Literature 8

(Campbell JL, Cutting WA, Elton RA, Minton EJ, Spreng J. The portable Nabarro weight-height anthropometric nutrition assessment chart. A field trial in three countries in Africa. Transactions of the Royal Society of Tropical Medicine and Hygiene. 1985 Jan 1;79(3):409-11.)

Studies on the basal energy metabolism in Indian population were conducted by Mukherjee and Gupta (1930), Masan and Benedict (1931), Krishan and Vareed (1932), Rahman (1936), Sikey and Malandkar (1939), Benerjeeet. al. (1963), Mason et. al. (1963), Banerjee et. al. (1948), Benerjee and Bhattacharya (1967), Benerjee and Sen (1957) published monographs for calculating the body surface area of Indian. Bhattacharya and Banrjee (1966) studies vital capacity of Indian children and young adult.

METHODOLOGY

Type of Research

This is a retrospective study.

Research Question

What are the factors that contribute significantly to Malnutrition in India ?

Specific Objectives:

1. To examine the burden on nutritional rehabilitation centers
2. To see the association of malnutrition with socio demographic characteristics
3. To evaluate the factors associated with malnutrition significantly
4. To recommend measures to public health officials & policy makers for providing safe abortion practices.

Data Sources

Systematically data was searched for burden on NRCs from government sources. We used the following sources for the following:

For Nutritional Rehabilitation Center

Data on Nutritional Rehabilitation Center was extracted from Indiatat.com. This data was collected by Ministry of Health & Family Welfare, Government of India. This website provides secondary level statistical data about India, its states, regions and various sectors like health, meteorology, industries, housing, tourism, transport, etc. We utilized data from states with malnutrition burden.

Various dependent & independent variables associated with malnutrition

The present study is based on a publicly available National Family Health Survey round 4, 2015-16 data . The NFHS series, provides information on population, health, and nutrition for India and each state/ Union territory. Series of NFHS was conducted under the stewardship of the Minister of Health and Family Welfare, coordinated by the International Institute for Population Sciences, Mumbai. The survey covered a range of

health-related issues, including child health, maternal, fertility, malaria, reproductive health, infant and child mortality, non-communication diseases, HIV knowledge and prevalence.

Dependent variable

Malnutrition (Stunted, Wasted, Underweight)

Independent Variables

Place of residence, Mother's Education, Wealth Index, Working Status, Number of children, Husband's multiple sexual partner, Child's birth weight, Pre-natal visits, Type of toilet facility, Source of drinking water & Place of delivery

Adequacy & Reliability of Data

These data are collected and entered by trained field experts under the nodal agencies for the survey. Both the above-mentioned sources are government monitored and hence reliable for conducting study/ research on it.

Data Analysis

Cross Tabulation

Dependent variables were cross tabbed with independent variables to obtain descriptive.

Binary Logistic Regression

Logistic regression sometimes called the logistic model or logit model has been used to analyze the relationship between multiple independent variables and a categorical dependent variable and estimated the probability of occurrence of an event by fitting data to a logistic curve. Binary logistic regression is typically used when the dependent variable is dichotomous, and the independent variables are either continuous or categorical. A simple logistic function is defined by the formula:

$$y = \frac{e^x}{1 + e^{a+\beta x}} = \frac{1}{1 + e^{-(a+\beta x)}}$$

Odds ratio

Odds of an event are the ratio of the probability that an event will occur to the probability that it will not occur. If the probability of an event occurring is p , the probability of the event not occurring is $(1-p)$. Then the corresponding odds is a value given by

Odds of {Event} $=p/1-p$

Since logistic regression calculates the probability of an event occurring over the probability of an event not occurring, the impact of independent variables is usually explained in terms of odds.

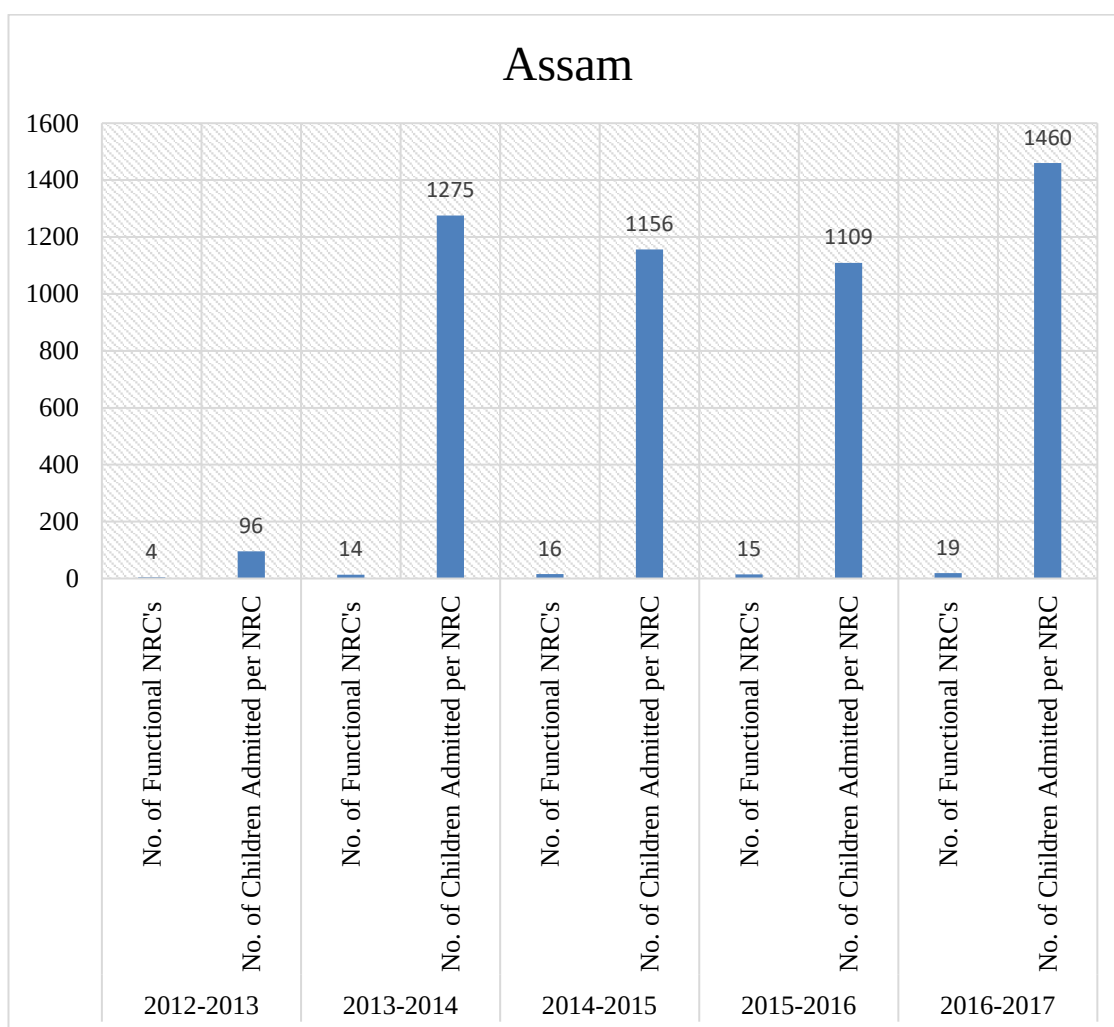
Software Support

Entire Analysis was carried out using STATA 14 & MS Excel 2016 version.

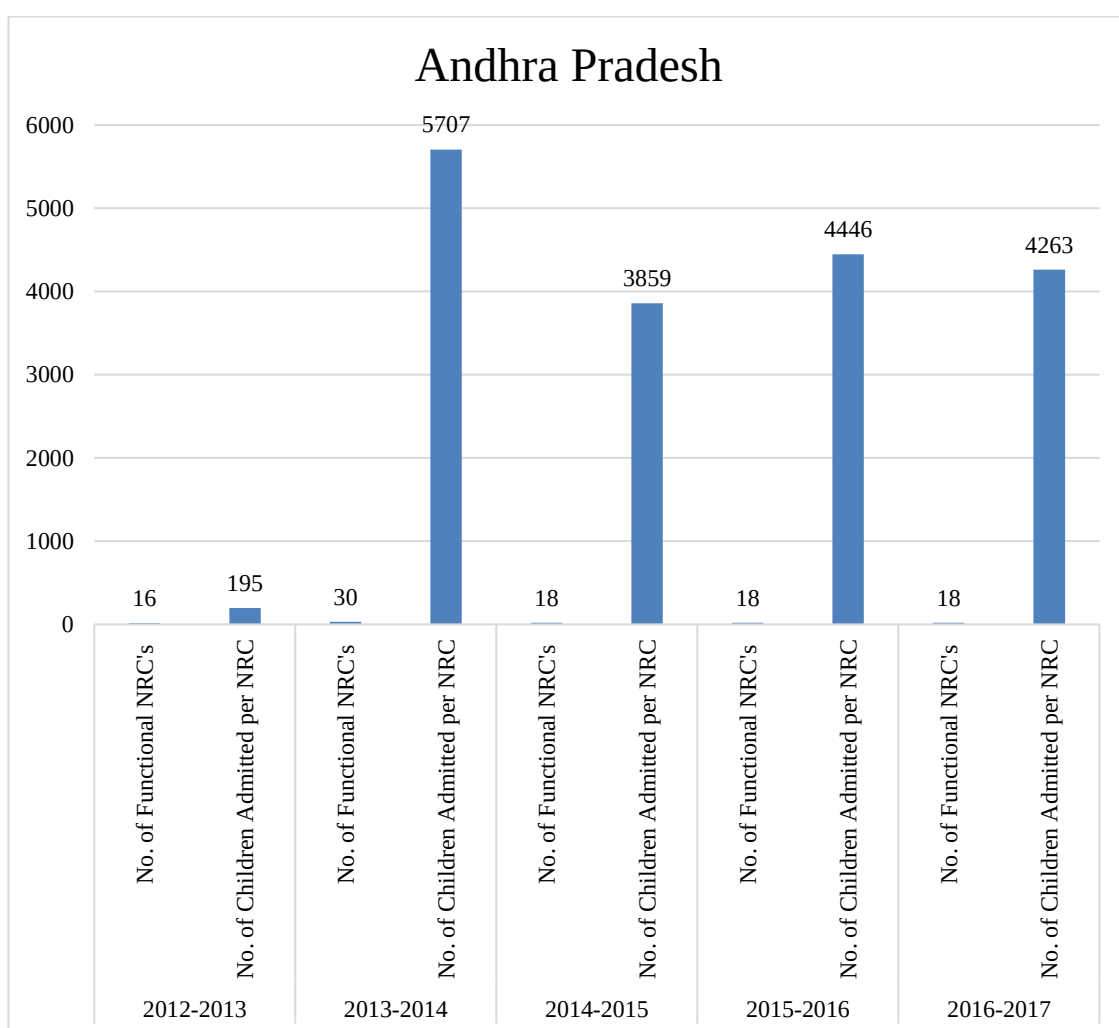
Ethical Considerations

Data utilized for this study is widely available in public domain and therefore doesn't require any IRB or ethical permission.

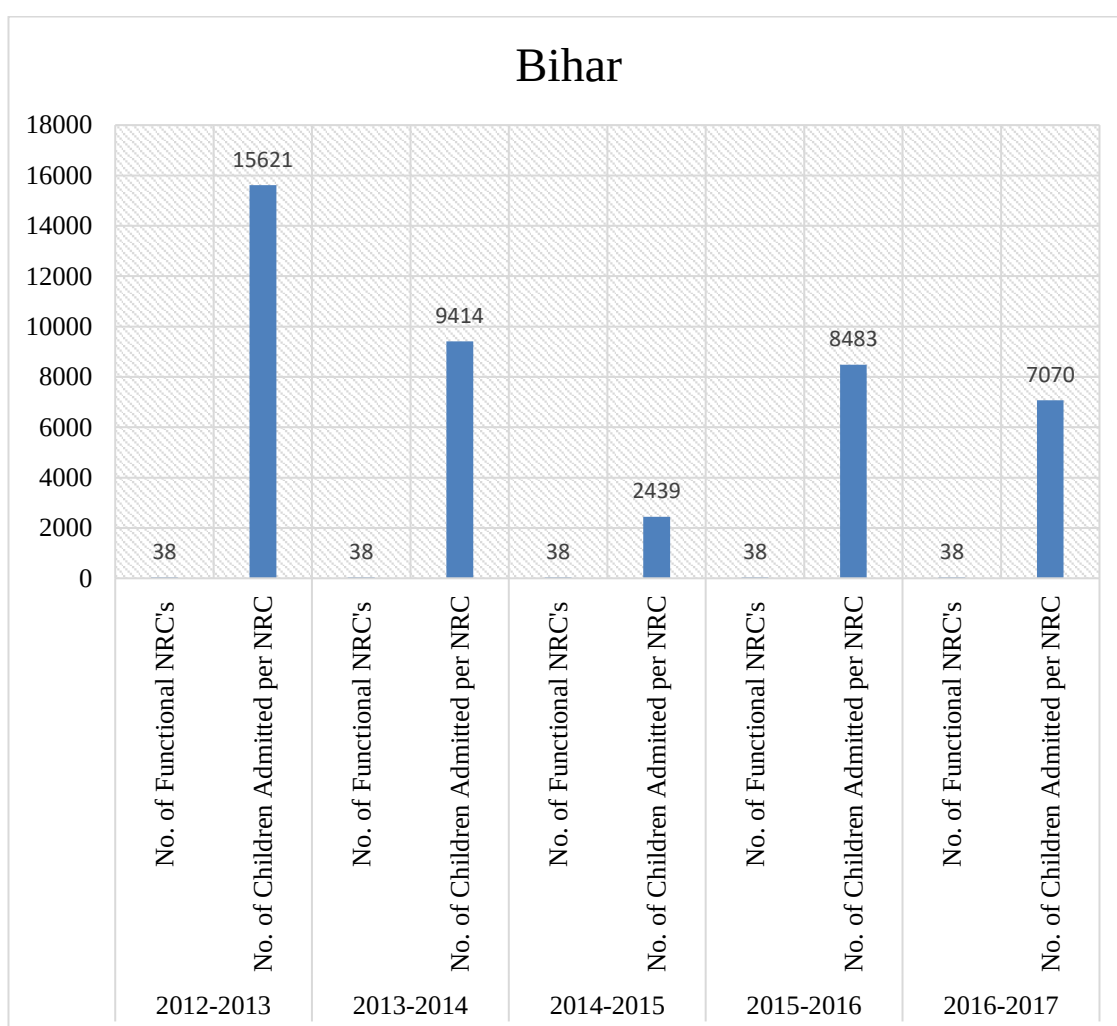
RESULTS



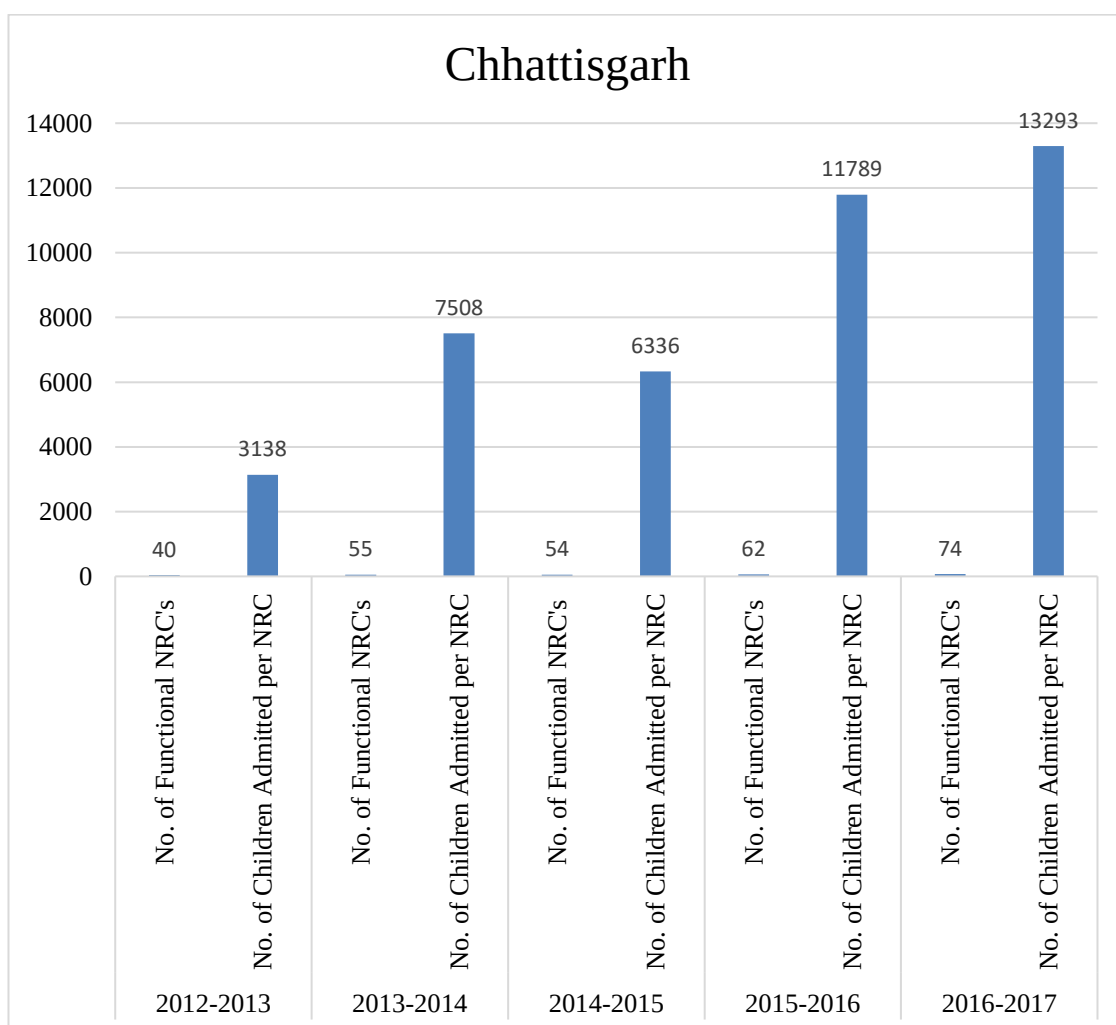
Interpretation: In Assam, There is a drastic increase from 2012-2013 to 2013 - 2014 in admitting malnourished children whereas number of NRC increased only from 4 to 14.



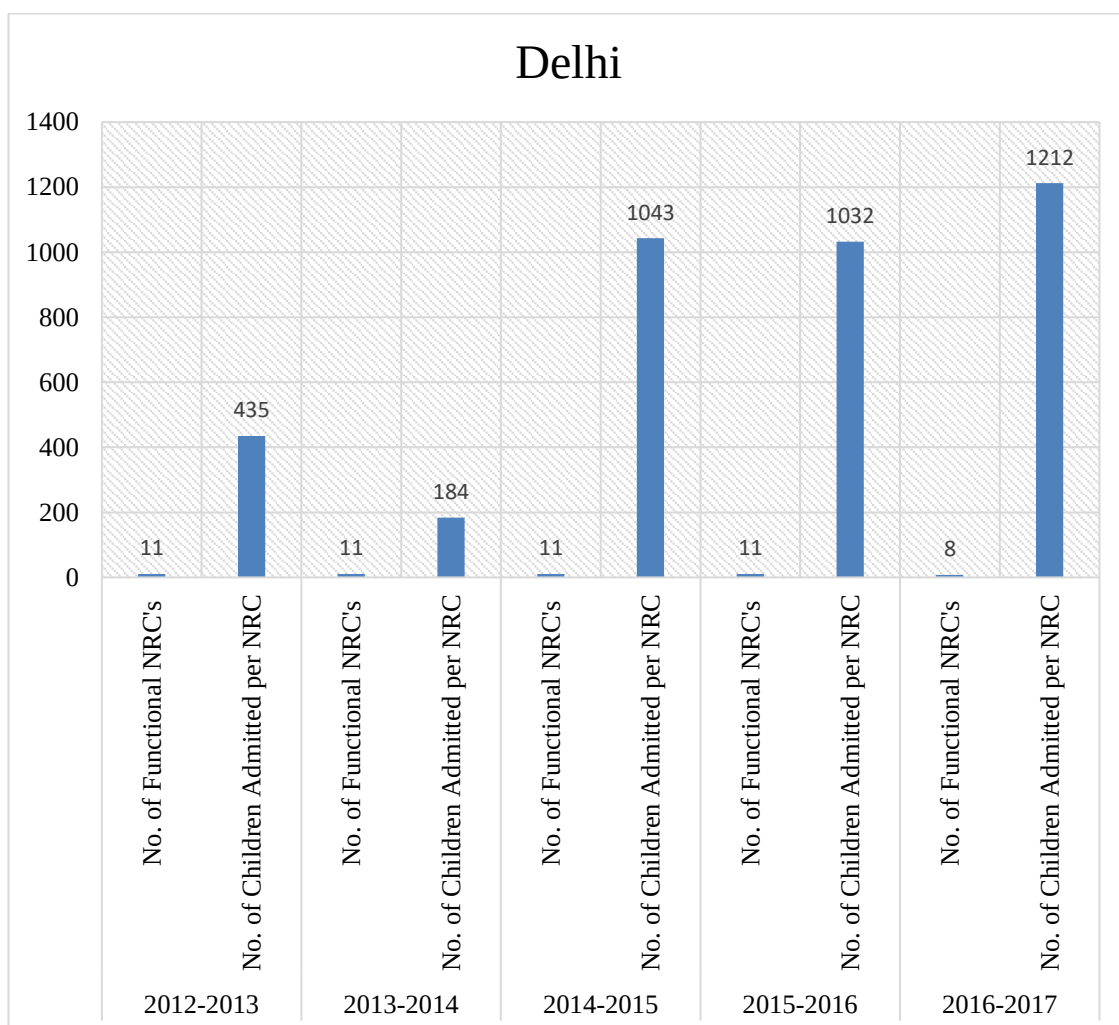
Interpretation: Andhra had the highest prevalence of malnutrition in the year 2013-14. There was increase in burden of malnutrition but there was no increase in number of NRC's.



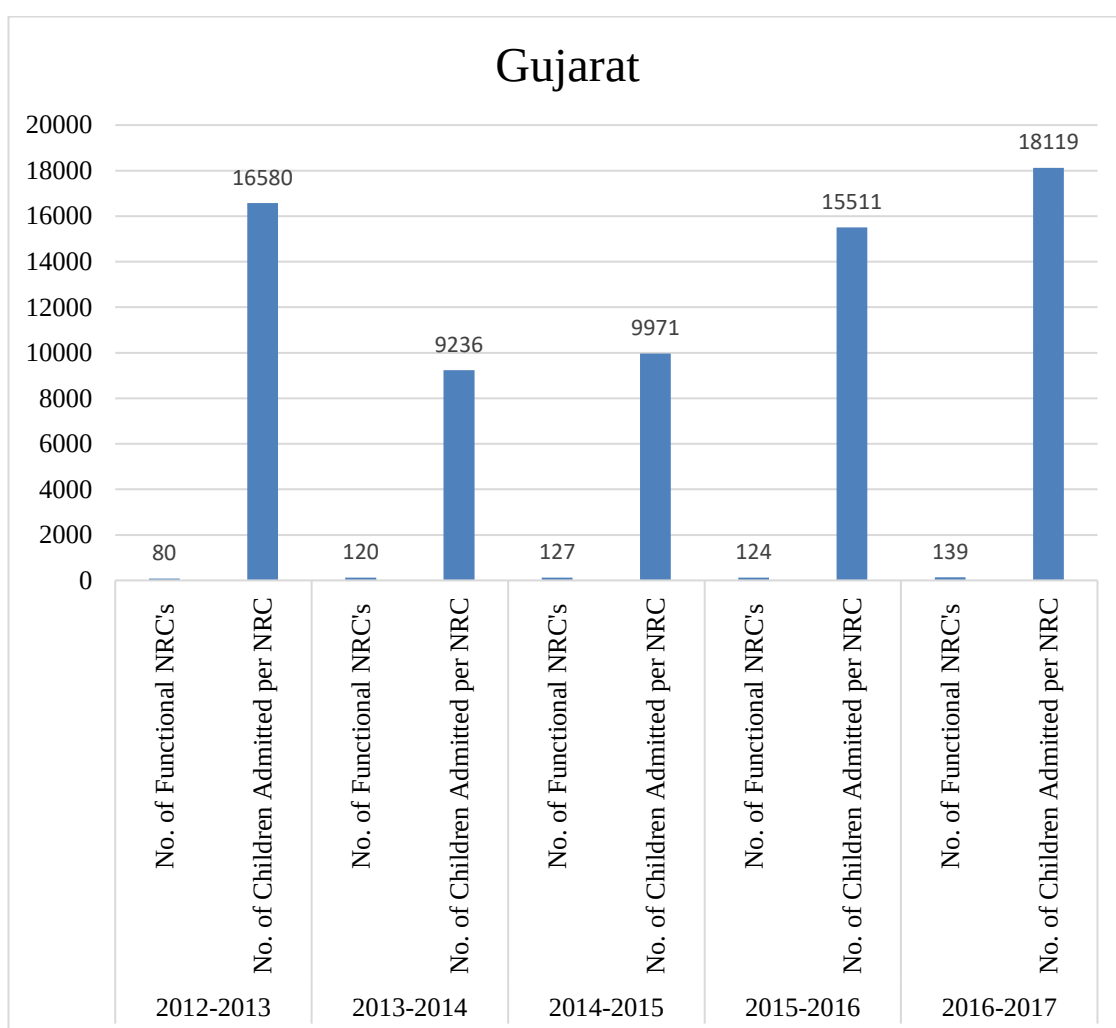
Interpretation: There was gradual decline in admissions of NRC in Bihar over a period of time but it again raised from the year 2014-15.



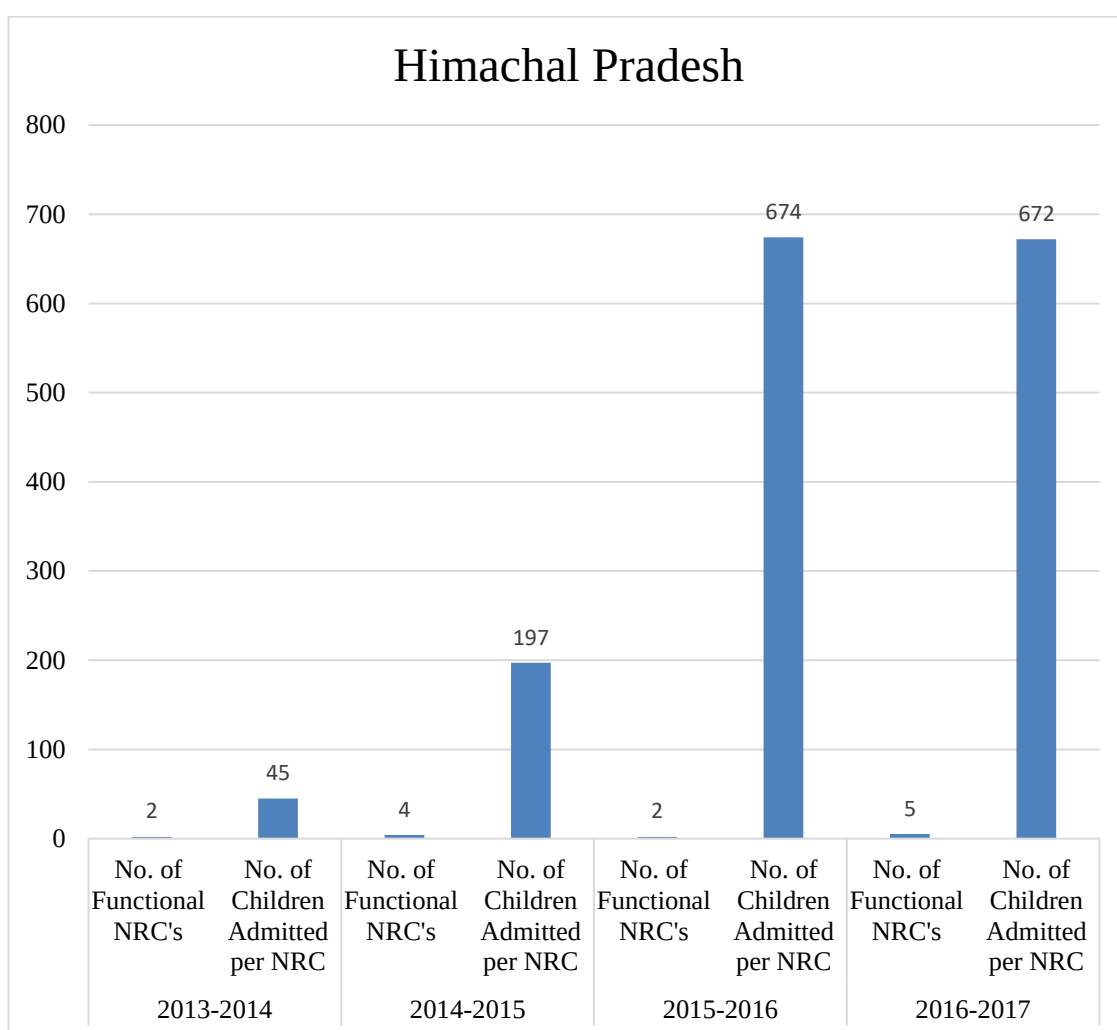
Interpretation: There was significant increase in the admission of NRC in Chhattisgarh from the year 2015-16 to year 2016-17. There was no increase in number of NRC's with the increase in malnutrition.



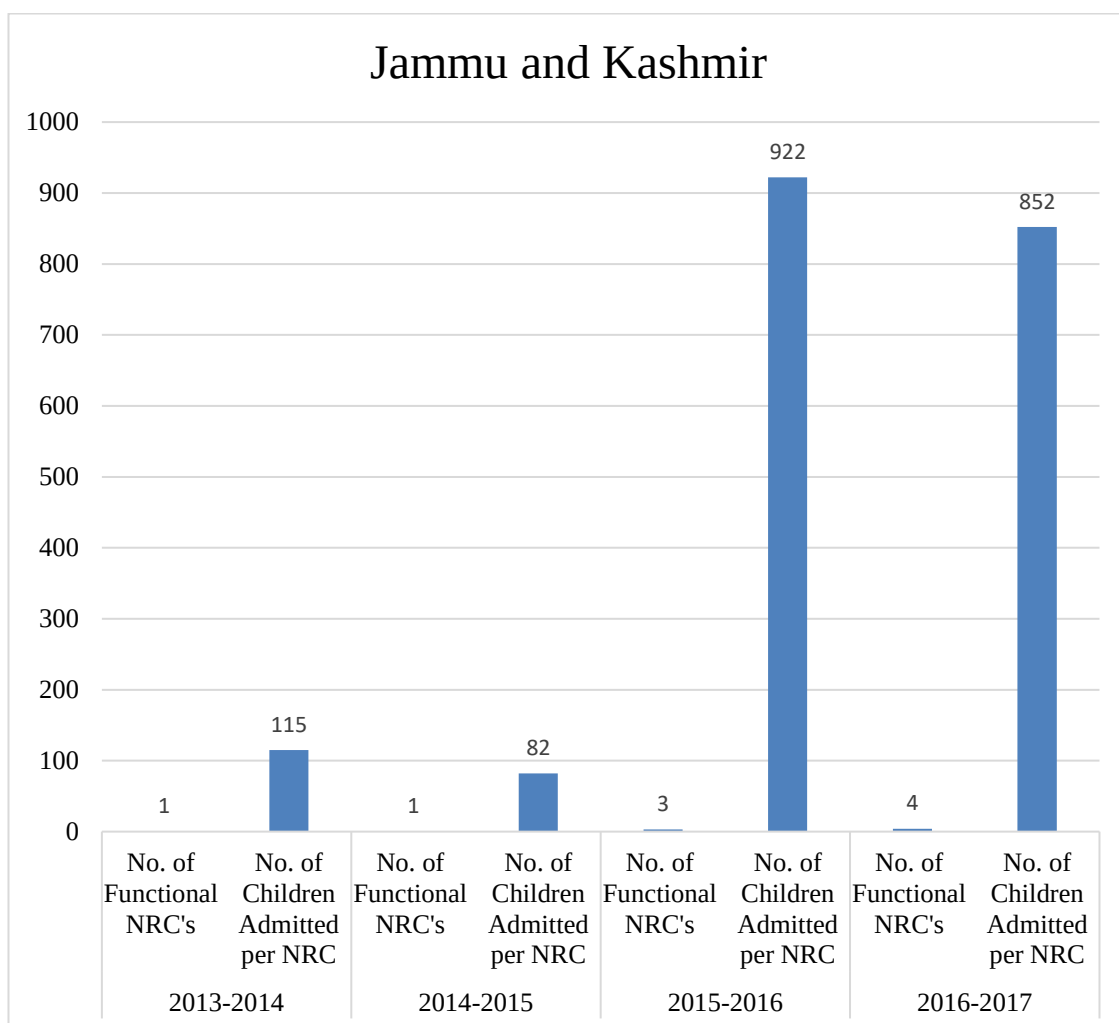
Interpretation: Delhi experienced the lowest burden on NRC admission in the year 2013-14. After the year 2014-15 the burden kept increasing.



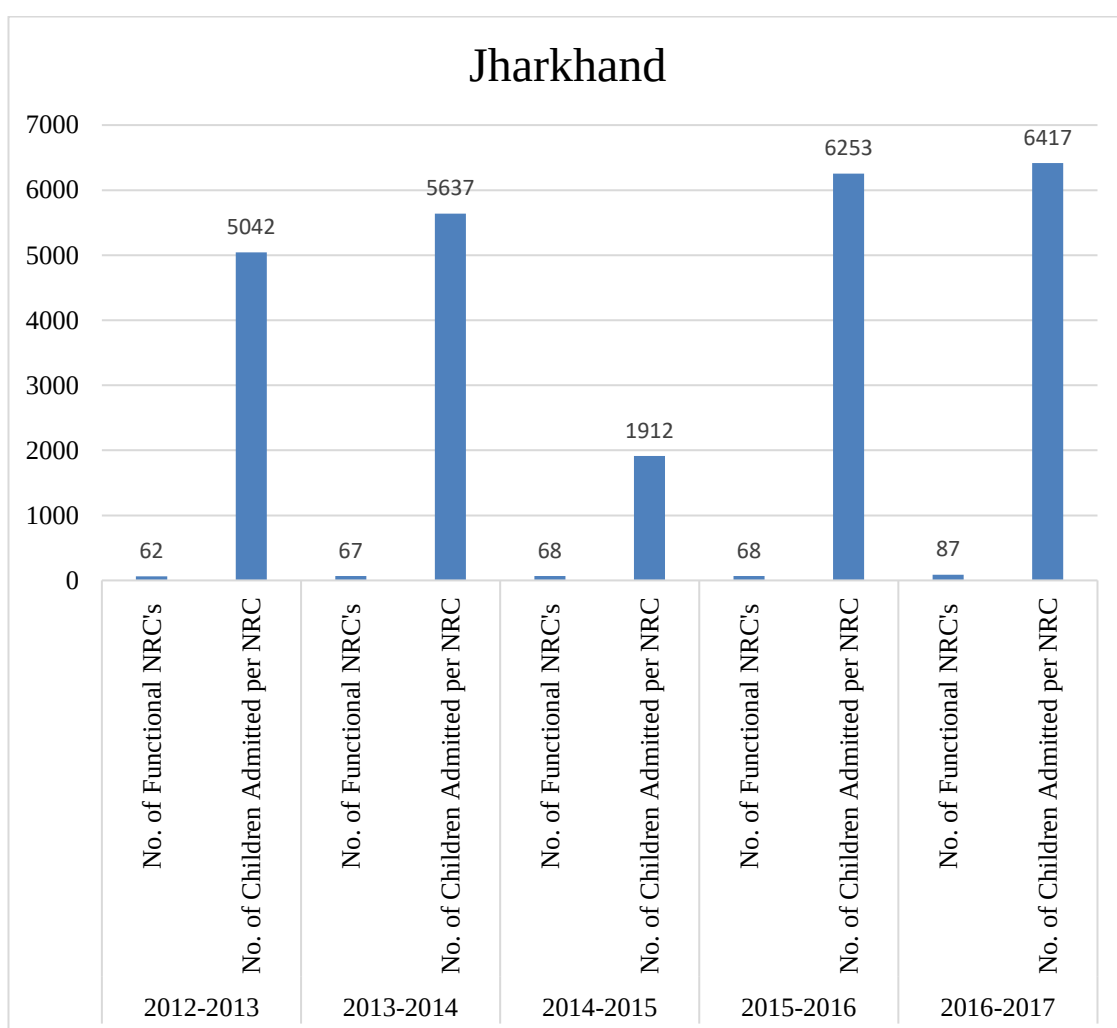
Interpretation: Gujarat has the lowest prevalence of Malnutrition in the year 2013-14. But there were no initiatives by the government in building new NRCs.



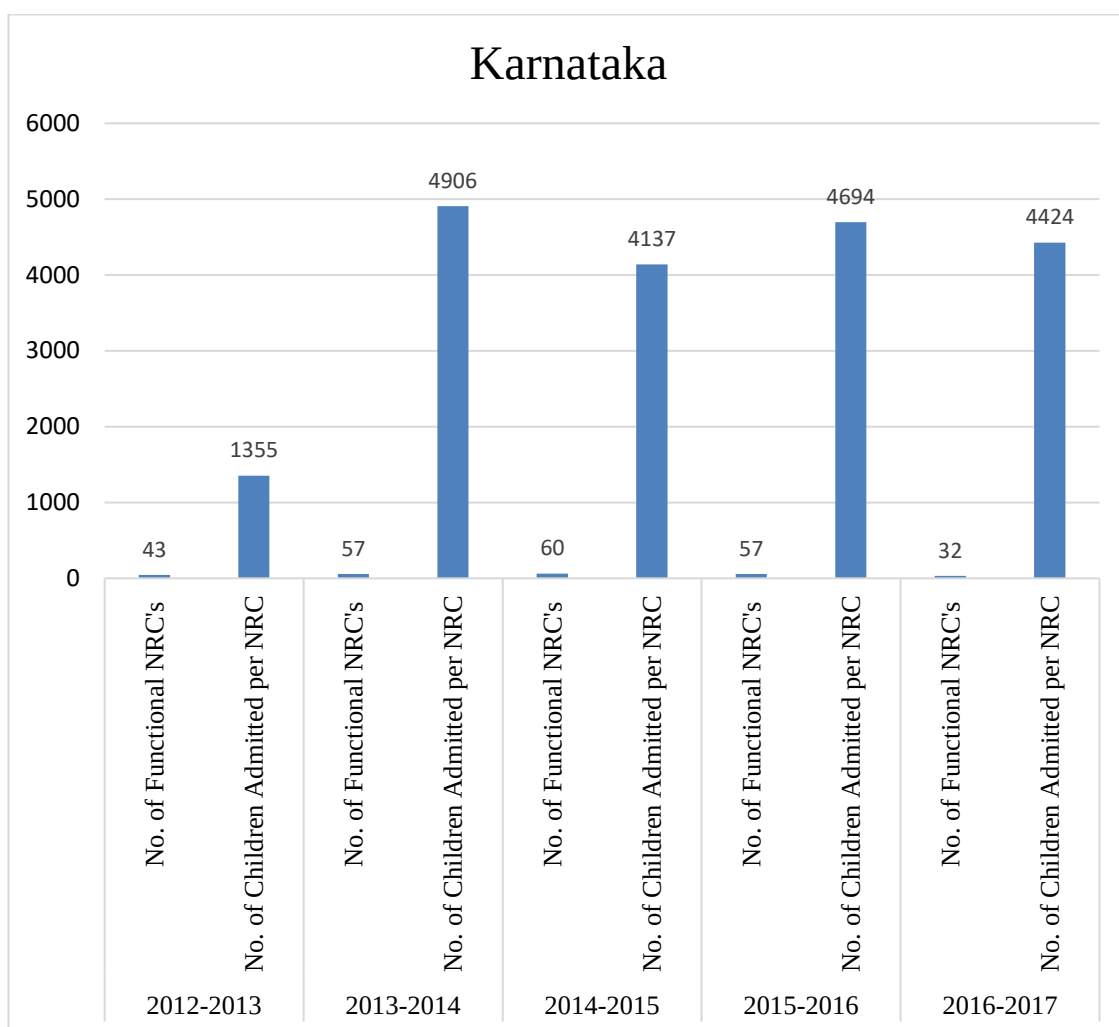
Interpretation: There was significantly less burden on NRC's in the year 2013-14. But after that there was peak raise in burden of malnutrition in the state.



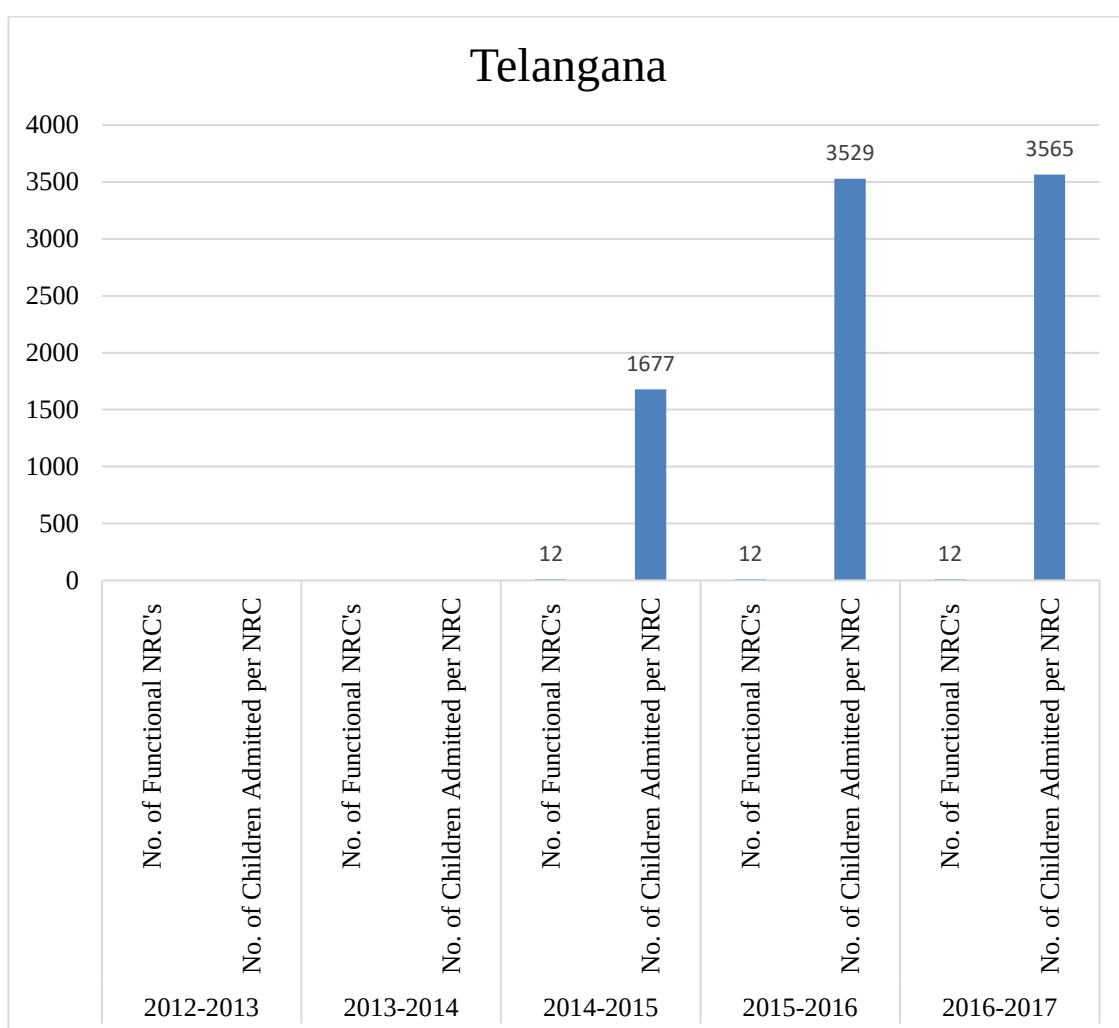
Interpretation: Jammu & Kashmir had the highest prevalence in the year 2015-16 and it continued there after.



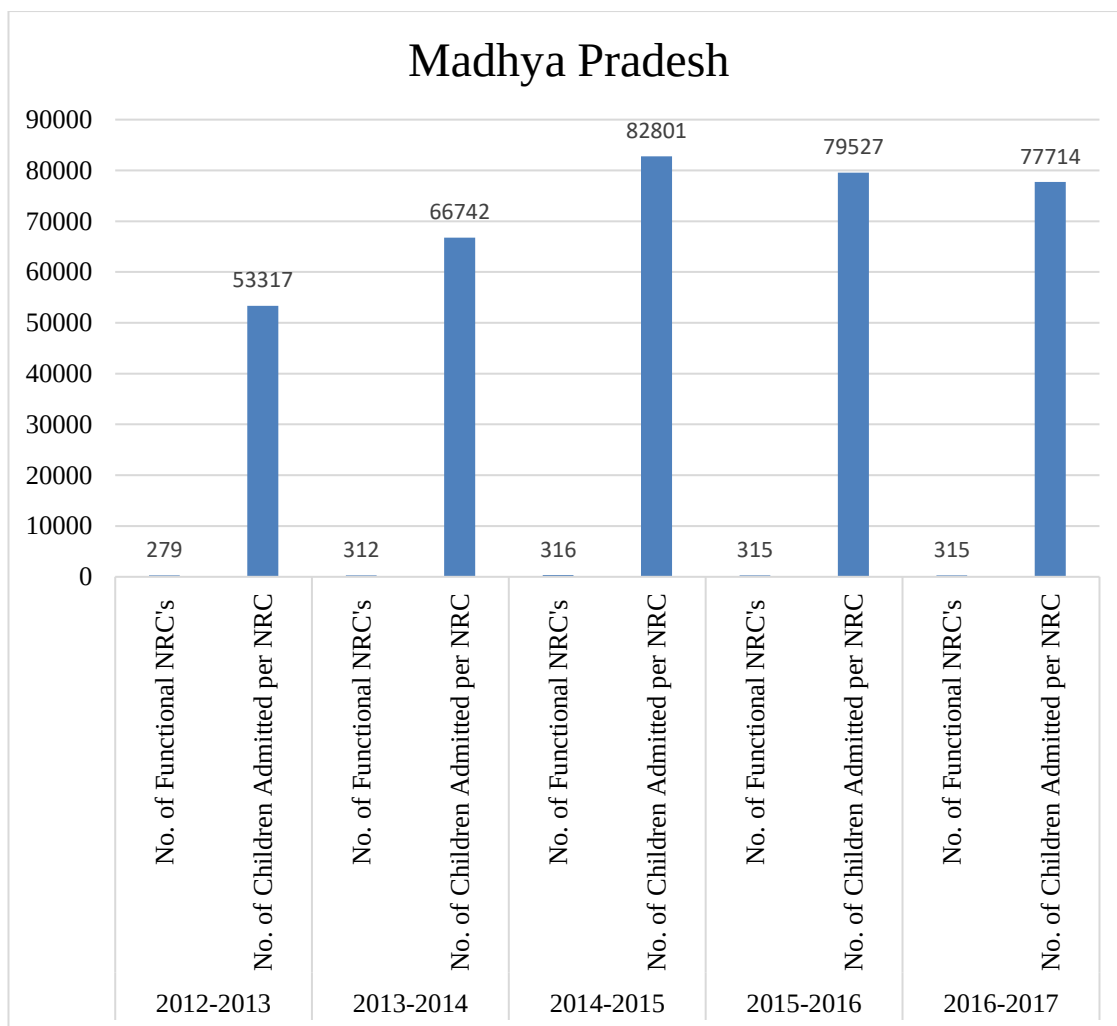
Interpretation: There was a decline in the admissions of NRC in the year 2014-15 , which indicated less prevalence of malnutrition in the same year but same as other states there were no new NRCs built.



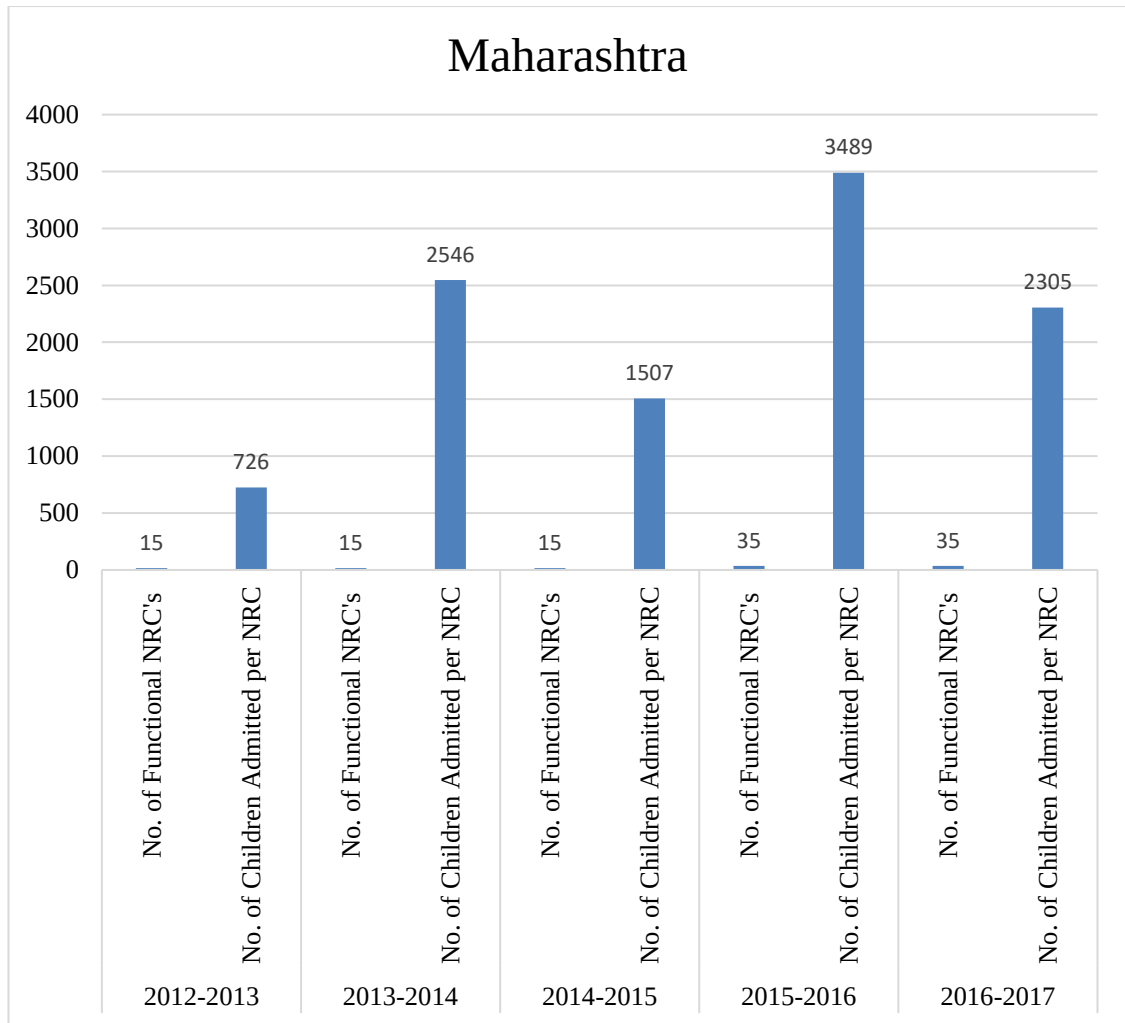
Interpretation: Karnataka has almost similar load on NRC's each year with the highest load in the year 2013-14.



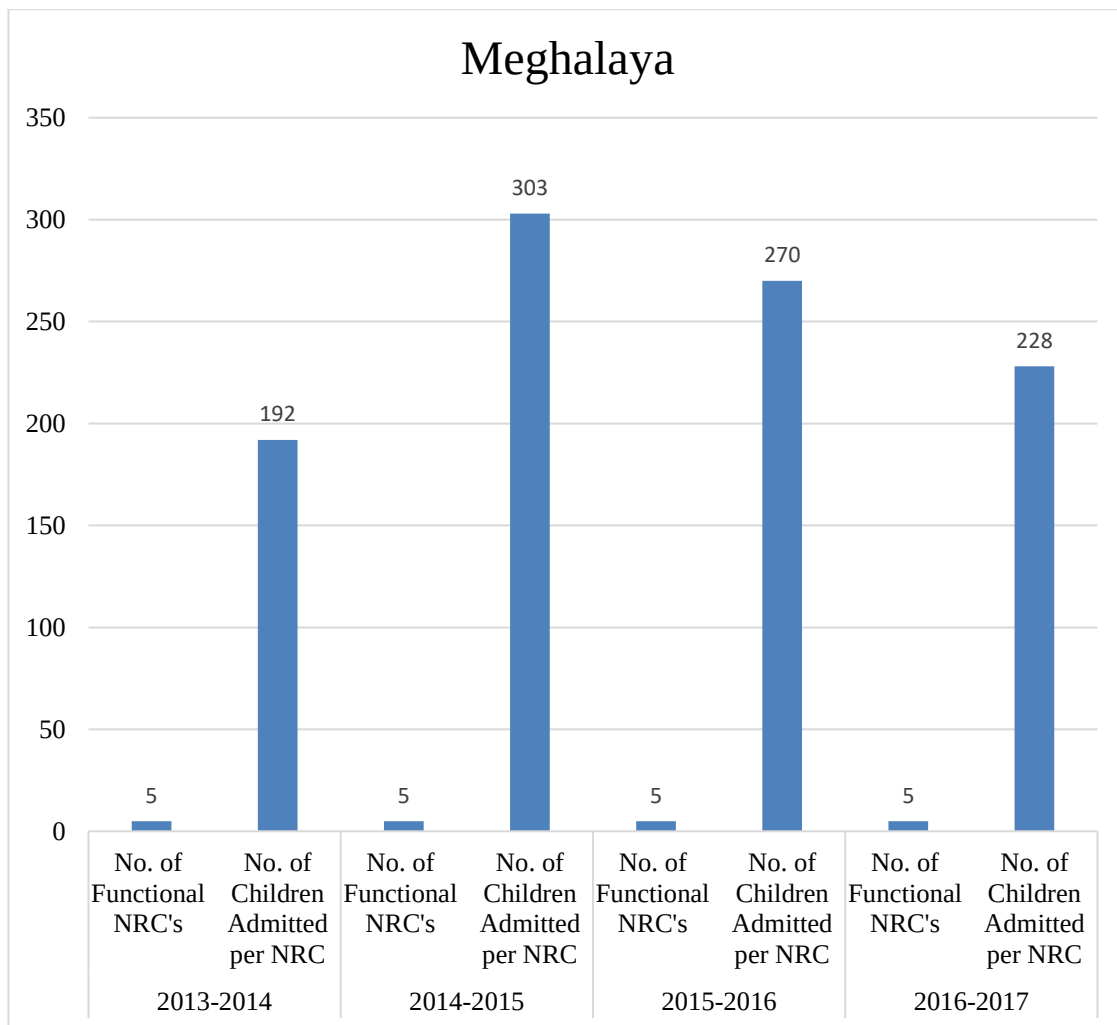
Interpretation: The load on NRC in Telangana was almost same in the year 2015-16 & 2016-17.



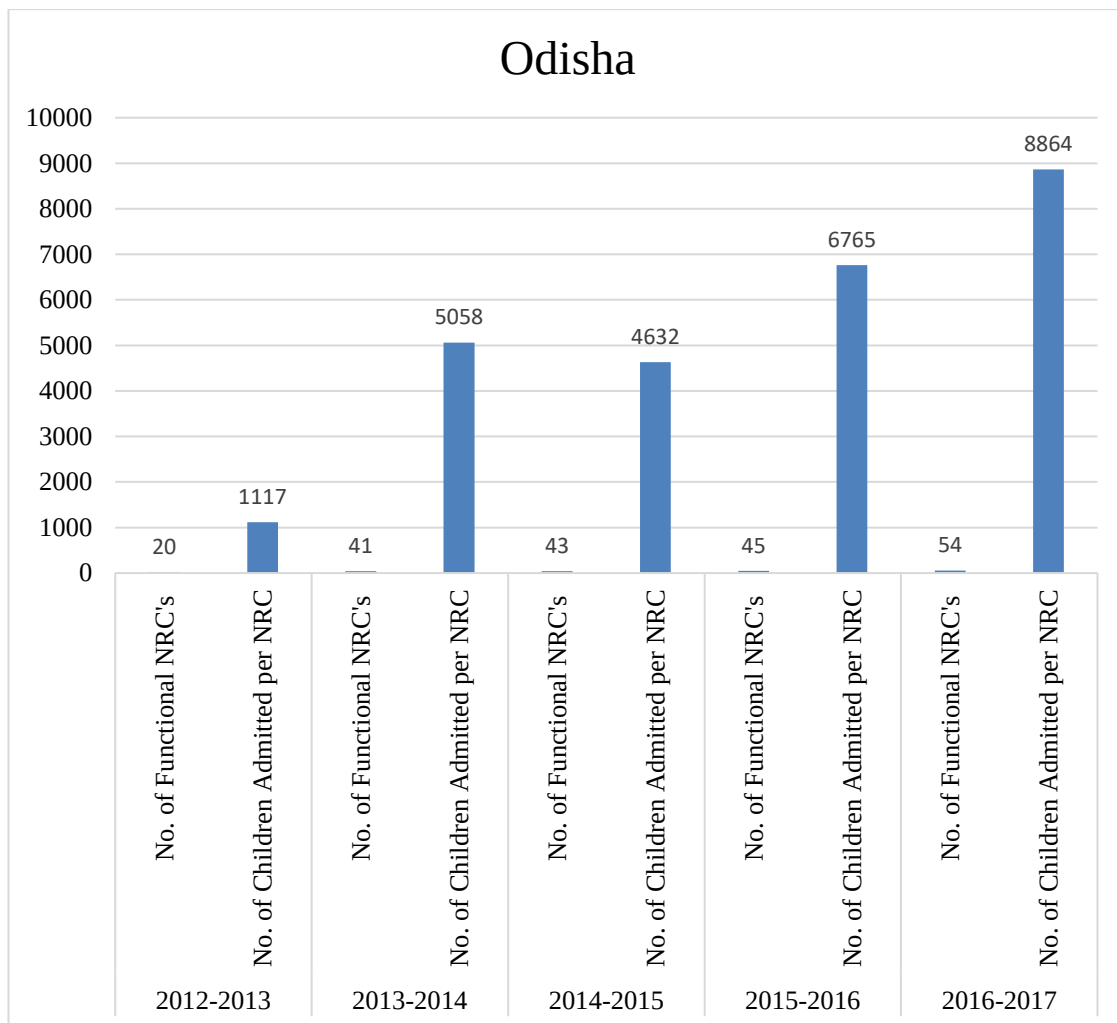
Interpretation: Madhya Pradesh has the highest prevalence of Malnutrition in the country with NRC number being significantly less.



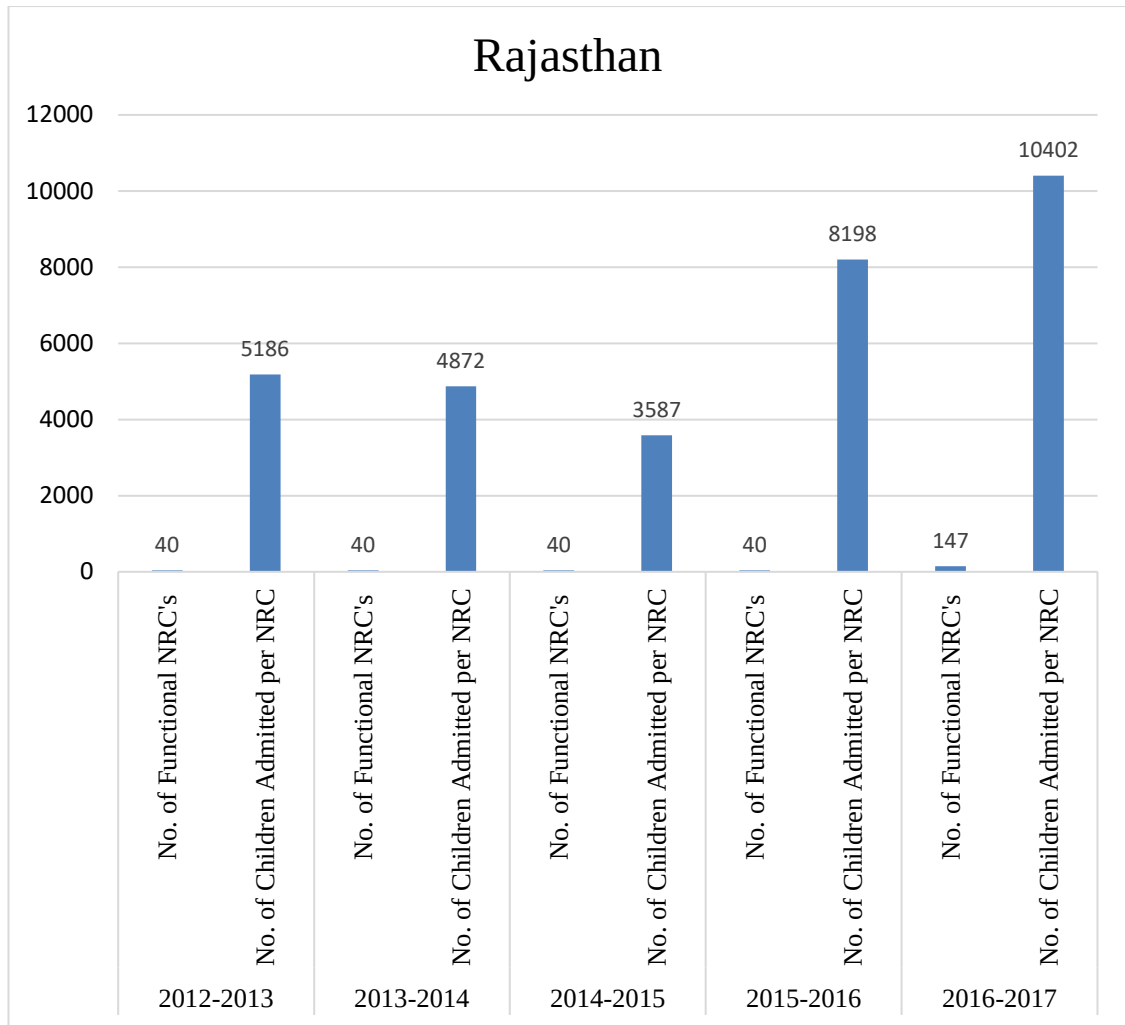
Interpretation: There was a decline in the NRC load in Maharashtra. But keeping in view the population density the government should open up more NRCs.



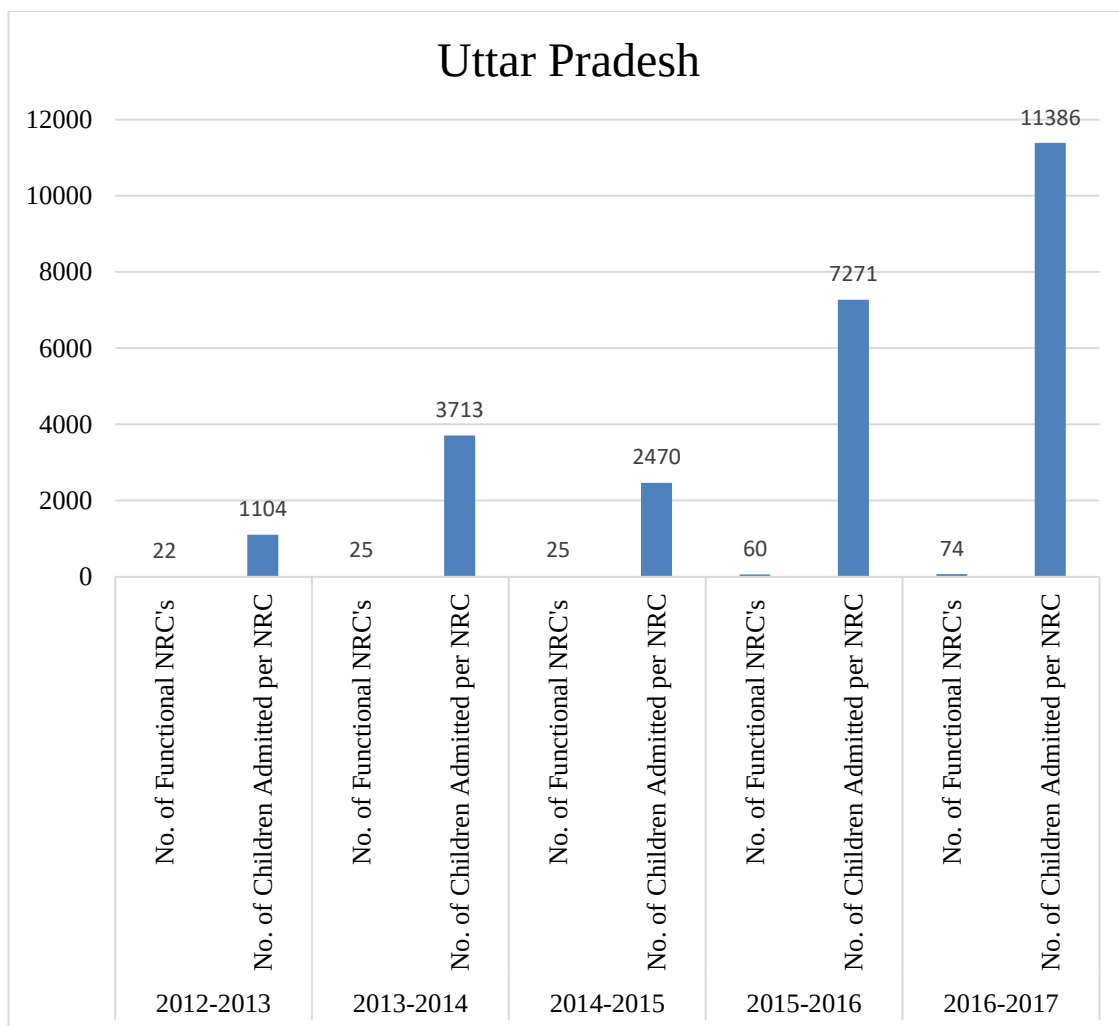
Interpretation: Meghalaya has the highest burden in the year 2014-15 and almost same in next two years.



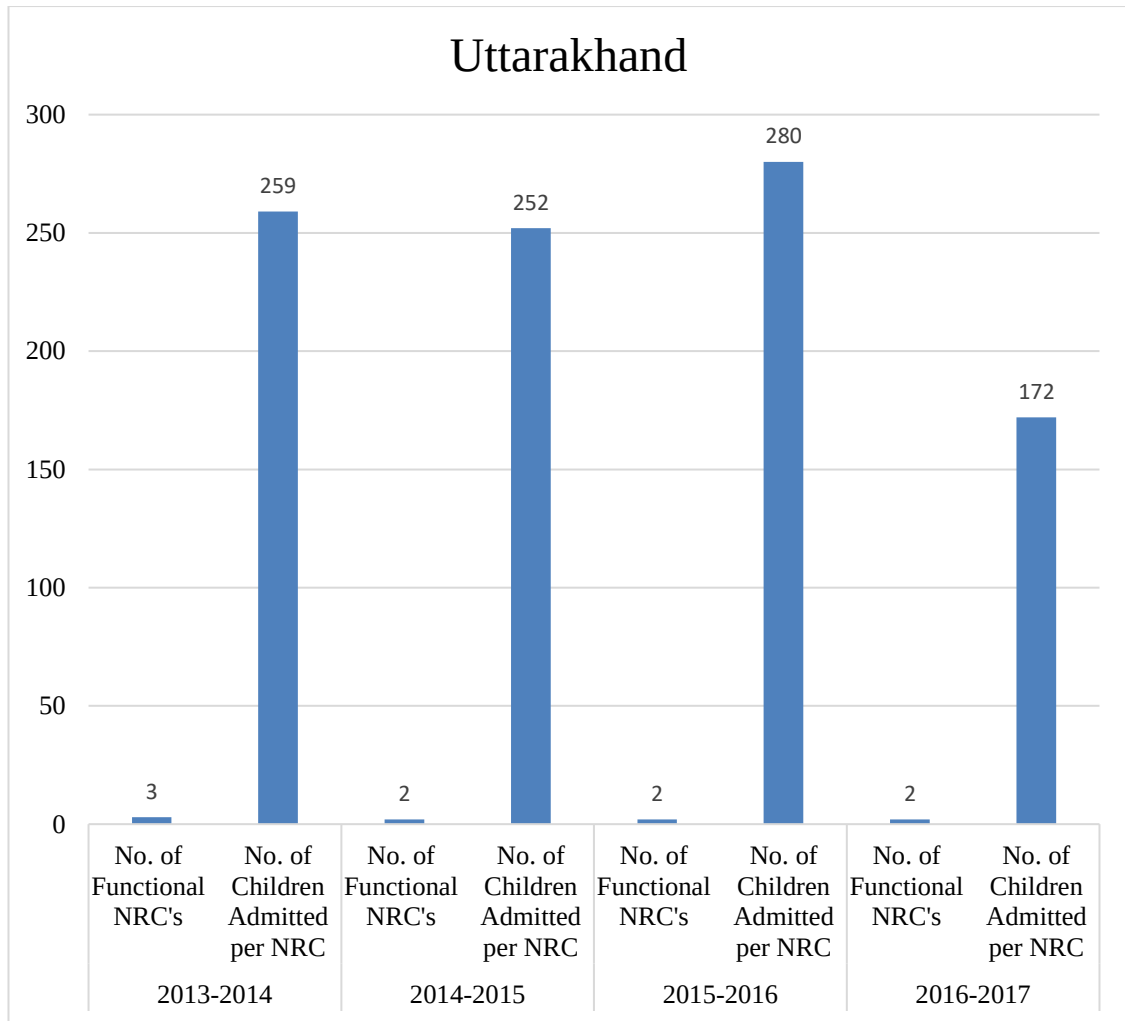
Interpretation: The burden on NRC's in Odisha was comparably low in the year 2012-13 & highest in the year 2016-17. There was also no increase in number of NRCs.



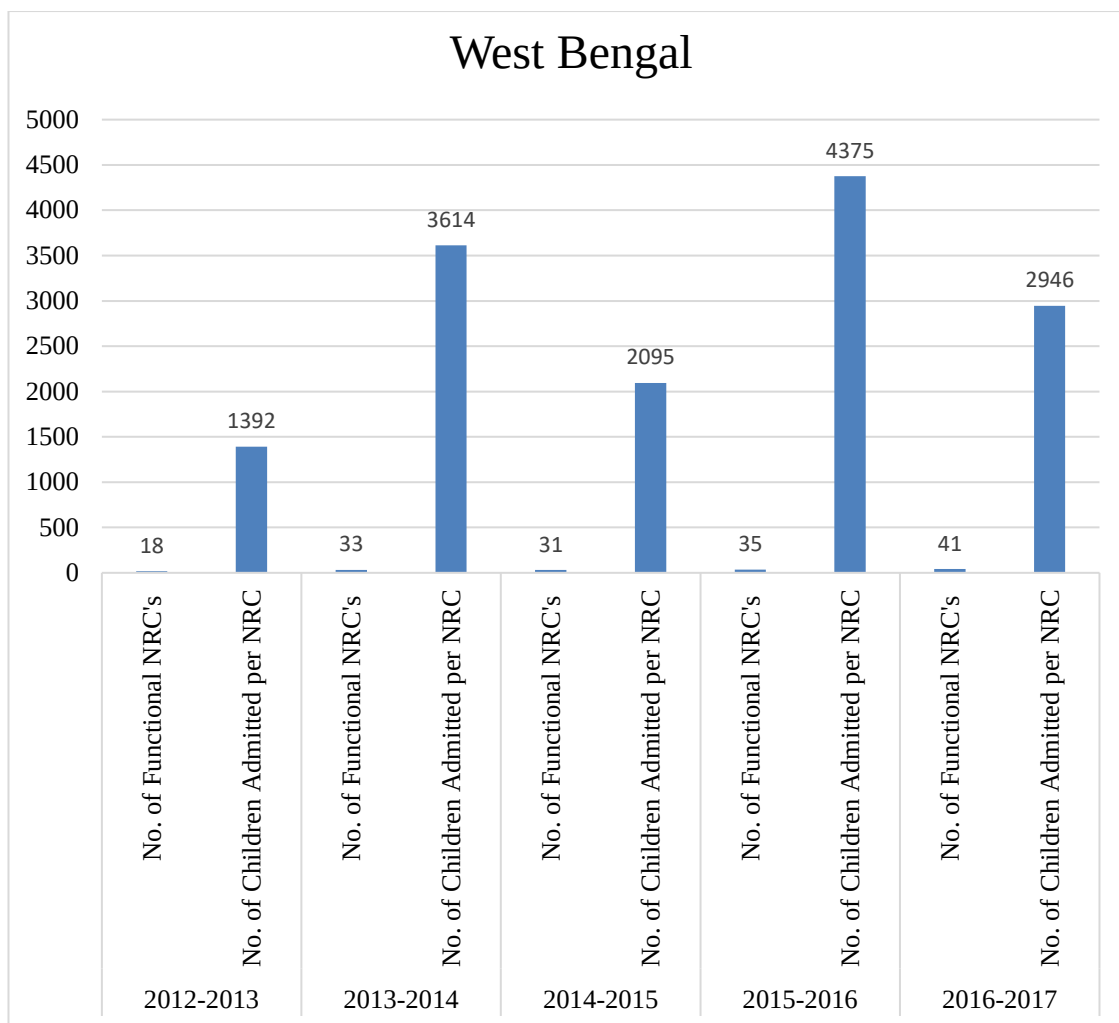
Interpretation: Rajasthan has notable load on its NRC's each year. There were slight increase in number of NRC in Rajasthan in the year 2016-17.



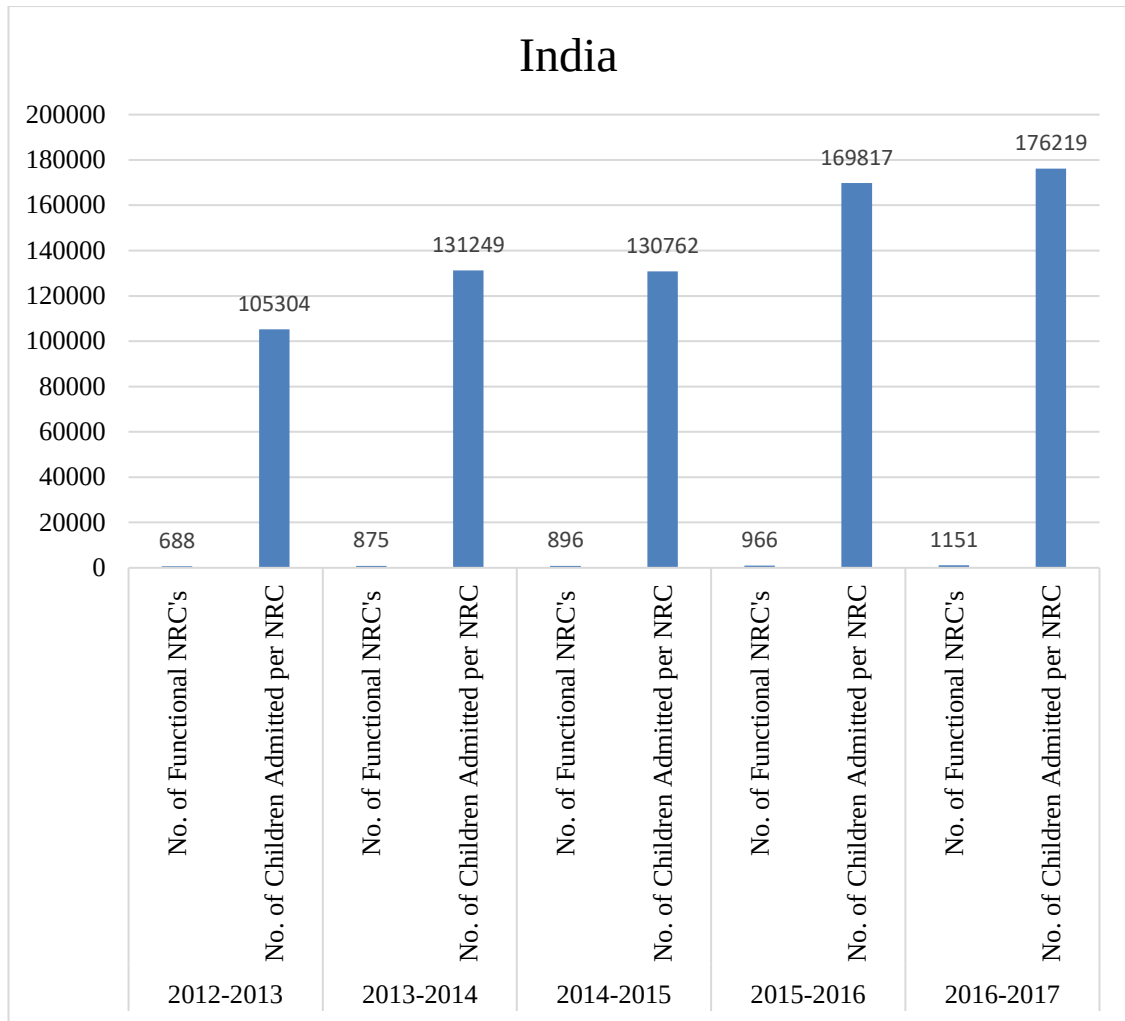
Interpretation: Burden on the NRC's in Uttar Pradesh kept raising from 2012-13 to the year 2016-17 with number of NRC being constant.



Interpretation: Uttarakhand noted a decrease in the admissions to NRC in the year 2016-17. But when there were high loads, even then there were less NRCs.



Interpretation: There was a decrease in the NRC admissions in West Bengal in the year 2014-2015 and again it raised in the year 2015-16.



Interpretation: Overall India experienced the highest burden of NRC admissions in the year 2015-2016 with no increase in number of NRCs.

Table 1: Prevalence of various determinants associated with Nutritional Status of Children

Characteristics	Nutritional Status of Child	
	Stunted/Wasted/Underweight	
	Male	Female
No. of Children		
Single child	45.4	43.7
2 children	46.9	47.3
3 children	51.1	53.0
4 children	55.0	56.2
5 children	59.0	60.3
More than 5 children	58.1	59.3
Husband's Multiple Sexual Partner		
Doesn't have multiple sexual partner	49.4	49.9
Has multiple sexual partner	30.4	91.1
Place of Residence		
Urban	42.3	42.2
Rural	52.0	53.0
Wealth Index		
Poor	57.8	58.9
Middle income	47.7	48.8
Rich	38.2	37.4
Child's Birth Weight		
Low	53.9	54.9
Normal	46.3	46.6
High	39.6	37.2
Did not weigh	56.2	56.6

Mother didn't know	50.9	53.0
Prenatal Visits		
Did not visit any doctor/ ASHA/etc.	58.1	59.2
Visited someone	48.7	48.1
Type of Toilet Facility		
Basic	42.6	42.7
Poor	56.6	57.3
Advance	43.0	39.8
Water Source		
Poor	48.0	48.2
Adequate	51.0	51.8
Advance	45.8	46.0
Mother's BMI		
Low	59.6	59.6
Normal	49.4	49.4
High	36.4	36.4
Mother's Education		
Mother Non literate (including Upto 5 years education)	57.4	58.2
6-8 years	49.8	50.6
9-10 years	42.7	44.3
11-12 years	39.5	39.2
More than 12 years	32.9	30.9
Place of Delivery		
Home	56.4	57.4
Institutional	47.4	47.8

Table 2: Odds Ratio of various determinants associated with Nutritional status of children

Children's Nutritional Status	Odds Ratio	Confidence Interval
No. of Children Ever Born		
Single child		
2 children	1.12***	(1.22,1.03)
3 children	1.16***	(1.3,1.05)
4 children	1.09	(1.26,0.94)
5 children	1.45***	(1.78,1.18)
More than 5 children	1.29**	(1.59,1.05)
Husband's Multiple Sexual Partner		
Doesn't have multiple sexual partner		
Has multiple sexual partner	1.34	(2.98,0.6)
Place of Residence		
Urban		
Rural	0.92*	(1,0.84)
Wealth Index		
Poor		
Middle income	0.76***	(0.84,0.69)
Rich	0.68***	(0.76,0.6)
Child's Birth Weight		
Low		
Normal	0.57***	(0.64,0.52)
High	0.37***	(0.51,0.26)
Prenatal Visits		
Did not visit any doctor/ ASHA/etc.		

Visited someone	0.98	(1.09,0.88)
Type of Toilet Facility		
Basic		
Poor	1.14***	(1.25,1.03)
Advance	1	(1.51,0.66)
Water Source		
Poor		
Adequate	0.88***	(0.96,0.8)
Advance	0.84***	(0.94,0.75)
Mother's BMI		
Low		
Normal	0.7***	(0.76,0.64)
High	0.45***	(0.5,0.4)
Mother's Education		
Mother Non literate (including Upto 5 years education)		
6-8 years	0.76***	(0.84,0.69)
9-10 years	0.62***	(0.68,0.55)
11-12 years	0.58***	(0.66,0.51)
More than 12 years	0.5***	(0.57,0.43)
Place of Delivery		
Home		
Institutional	0.97	(1.11,0.86)
Constant	4.97***	(6.32,3.91)
<0.01=***, <0.05=** & <0.1=*		

India has significant prevalence of malnutrition, especially in Madhya Pradesh. Lowest prevalence is in Kerala. Hence there is high load on the Nutritional Rehabilitation Center. Government aided NRC are lacking in almost all the states which contributes to higher load on a single NRC.

Table 1 shows that there was more prevalence among girl child as compared to male child. Prevalence was also high among children residing in rural areas with poor housing conditions and poor socio-economic status. Significant percentage children were not weighed during birth time.

Logistic regression findings presented at **Table 2** shows that the odds of a child being stunted, wasted or underweight of those women who has two or more number of children are more likely than a child without any siblings. Multiple sexual partner of the husband doesn't show any significant association with a child being stunted, wasted or underweight. The odds of child being stunted, wasted or underweight is 0.08 times less likely among child of women from rural areas than from those residing in urban areas. The odds of children getting stunted, wasted or underweight is less among the middle income & rich compared to those in poor category. The odds of child getting stunted, wasted or underweight is when the child is born with a normal or high weight compared to those born with low birth weight.

There was no significant association between pre-natal visits and child getting wasted, stunted or underweight. The odds of being stunted, wasted or underweight is 0.14 times more likely in children living with poor toilet conditions. The odds of child getting stunted, wasted or underweight is less likely among families using adequate and advanced water facilities than compared to those using poor water sources. Odds of child getting stunted, wasted or underweight is less likely among women with normal & high BMI than compared with women with low BMI. As the odds of mother's education increases the chances of child being wasted, stunted or underweight decreases. The odds of child being stunted, wasted or underweight is 0.03 times higher in cases of home deliver than institutional deliveries.

DISCUSSION

Many important aspects of stunting, wasting & underweight was revealed by the presented study. Nutrition's importance as a foundation for healthy child developments is underestimated. Poor nutrition's leads to ill health which further leads to deterioration of health and mental growth. These effects are mostly found in infants and young children who suffer the highest risk of disability and death associated with it.

The presented study revealed that there are less chances of a child getting stunted, wasted or underweight if he/she doesn't have any siblings. Many studies have evidenced that socio-economic status is a major determinant of child nutrition. Hence, parents with a single child could better concentrate on dietary intakes of the child. The study also found significant association between low income category family and their child getting stunted, wasted or underweight. This finding is supported by many literatures which states that diet quality is associated with economic status and life style. This is because of their lower priority for health as a motive for food purchase. Child's birth weight was found to have significant association with the dependent variable. A similar study evidenced that the prevalence of malnutrition was higher among children born with low birth weight as compared to a child born with normal weight. The study also found significant association between sources of water, type of toilet facility with a child getting stunted, waster or underweight. Improved conditions of sanitation and hygiene practices are associated with reduced prevalence of stunting in rural India. Quality of WASH especially those related to the use of sanitary latrines, hand washing, and water treatment practices would also result in a significant decrease in prevalence of wasting among U5 children. We also found that the risk of a child getting stunted, wasted or underweight decreases with increase in mother's education level. A study from sub-Sahara Africa states that maternal education as a strong predictor of child stunting. The study also revealed that the risk of malnutrition is less among children who were born in healthcare institution then compared to home deliveries.

LIMITATIONS

Despite of significant findings the presented study had many limitations. As this study is based on secondary data, we are not aware how the data collection process was done with what level of accuracy, this limits the type of analysis to be performed. Further many individuals responses were missing because of which we cannot generalize the study. Under reporting is inescapable.

CONCLUSION

Despite of enormous nutrition programs initiated by National Health Mission, Department of Health & Family Welfare, the prevalence of malnutrition continues to remain high in many parts of the countries. Our study concludes that Wash practices, Mother's BMI, birth weight of the child to be the strong predictors for child nutrition.

The study further recommends that public health officials should visit the ground to understand the reality and avoid biases related to the supply of food packet's under Poshan Abhiyan. ASHA & AWW should be imparted with training from time to time so that they can create better awareness among the community. Government officials need to identify gaps in the current on-going nutritional programs and work on it with the help of experts in public health. We also recommend setting up of more NRCs in states to reduce the current burden.

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