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Decoding the 'First 1000 Days' Programme: Insights and Implications for India

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Abstract

Optimal nutrition in the first 1000 days is crucial for long-term health. In India, high neonatal mortality stems from factors like poor care, preterm birth, low birth weight, NCDs, congenital conditions, and infections. The study aims to evaluate the effectiveness of these interventions and highlight the need for targeted outreach and culturally responsive health education. Using the fifth round of the National Family Health Survey-5, the present study applied a multivariate ordered logistic regression model to examine the continuum of care for maternal and child health, focusing on integrating healthcare, nutrition, and early childhood development in India. Findings indicated that (35.1%) SC/ST received a good continuum of care, which is higher than the national average of (31%). Besides, continued care is found to be good among mothers covered by health insurance (36.9%) and having full exposure to mass media (33.5%). Odds of receiving better continuum of care among mothers aged 20-24 years at first birth was more (AOR: 1.14) than giving birth at higher age-groups. After the Rashtriya Bal Swasthya Karyakram (RBSK) scheme was introduced, a significant reduction in anaemia, wasting, and being underweight was observed among Indian children. This underscores the importance of comprehensive and integrated service delivery to improve health trajectories from the earliest stages of life.

Keywords

1000 days, Continuum of care, Nutrition, Anaemia, India

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Background

Early care during pregnancy, childbirth, and infancy is essential for shaping a child's growth and development. Malnutrition continues to be a significant global health issue, especially in developing nations. The National Family Health Survey-5 (2019-21) reported a prevalence of 7.7% of malnutrition in India (Ulahannan et al., 2022). Children suffering from severe acute malnutrition have low survival rates, contributing to 3.5 million deaths among children under five(Lenters et al., 2013). Child mortality rates in India have remained high, with leading causes including preterm birth, low birth weight, non-communicable diseases, congenital conditions, and infections like pneumonia. Maternal nutrition is vital in determining favorable birth outcomes (Ramadhan et al., 2020). Micronutrient supplementation during pregnancy, particularly iron and zinc, not only supports maternal health but also builds the nutritional foundation for the child. Iron deficiency in-utero can disrupt brain maturation, leading to long-term cognitive and psychological challenges (M. M. Black, 2012; M. M. Black et al., 2011). The exposure of the developing fetus to such deficiencies underscores the importance of adequate maternal nutrition to optimize a child's future mental and neurological health. Zinc deficiency contributes to growth retardation and infections in both mothers and children (Christian & Stewart, 2010; Hess et al., 2009) .

India has the largest number of malnourished children globally, with around 26 million children suffering from severe malnutrition (D. & V. V., 2020; J Kanmony, 2020). Approximately 33% of the world's wasted children are from India(D. & V. V., 2020). Nearly 38.7% of children under five are stunted, and 21% are wasted as of 2019 (Bhutta, 2016; J Kanmony, 2020). According to a global estimate, more than 200 million under-five children do not attain their full developmental potential (Grantham-McGregor et al., 2007). Another study found that approximately 250 million children under five are at risk of not reaching their developmental potential, due to stunting and poverty in low and middle-income countries (M. M. Black et al., 2017). This risk is particularly pronounced because the first 1000 days of a child’s life play a crucial role in shaping their long-term development. The growth of a child is influenced by a variety of biological factors, including maternal nutrition during pregnancy, gestational age, birth weight, duration of breastfeeding, malnutrition, infections, psychological and environmental exposure, being the greater determinant in the maturation process (Kattula et al., 2014; Lu, 2012).

Despite significant progress in reducing maternal and child mortality, improving the quality of care remains vital for

achieving healthy survival. The Rastriya Bal Swasthya Karyakram (RBSK) scheme, under the Ministry of Health and Family Welfare, shifted the focus from mere survival to healthy survival. The 'First 1000 Days' programme, covering conception to the first two years of life, is designed to deliver essential medical and therapeutic care services, free of cost, during critical brain development years. This includes promoting healthy lifestyles and child-rearing practices. Due to nutrition insufficiency during pregnancy till 24 months of a child's age, there is growth faltering (Bloem et al., 2013). Proper nutritional interventions during this period can prevent growth faltering, ensuring long-term benefits for a child's health, learning, and overall development.

The continuum of care in the first 1000 days of life refers to a comprehensive approach to supporting child health and development from conception to the child's second birthday. It recognizes that this period is critical for shaping a child's future health, growth, and well-being.

The essential elements are as follows:

***Antenatal Care*:** It begins during pregnancy and includes regular health check-ups, nutrition counselling, and health monitoring of the mother to ensure a healthy pregnancy. Prenatal care aids in the identification and management of any potential dangers or difficulties that may impact the mother or the developing infant.

***Safe Delivery*:** The risk of difficulties during labour is reduced by ensuring access to experienced birth attendants and delivery in a safe and sanitary environment. If necessary, this involves providing emergency obstetric care.

***Postnatal Care*:** Following delivery, both the mother and the newborn require immediate and continuous care. This includes monitoring the baby's health, promoting early breastfeeding initiation, administering immunisations, and teaching parents on newborn care practises.

***Nutrition*:** Adequate nutrition is critical to a child's development. Breastfeeding exclusively for the first six months, followed by proper complementary feeding, provides critical nutrients and promotes healthy growth.

***Immunizations*:** Vaccinations administered on time protect children from a variety of infectious diseases, preventing sickness and potential problems.

***Preventive Care*:** Regular health checks, growth monitoring, and developmental evaluations can assist uncover any potential health issues or developmental delays in a kid. Early detection enables prompt intervention and support.

***Early Childhood Development*:** Promoting cognitive, social, and emotional

development in children through early stimulation, responsive caring, and access to high-quality early childhood education improves their overall well-being and sets them up for future success.

Theoretical Framework

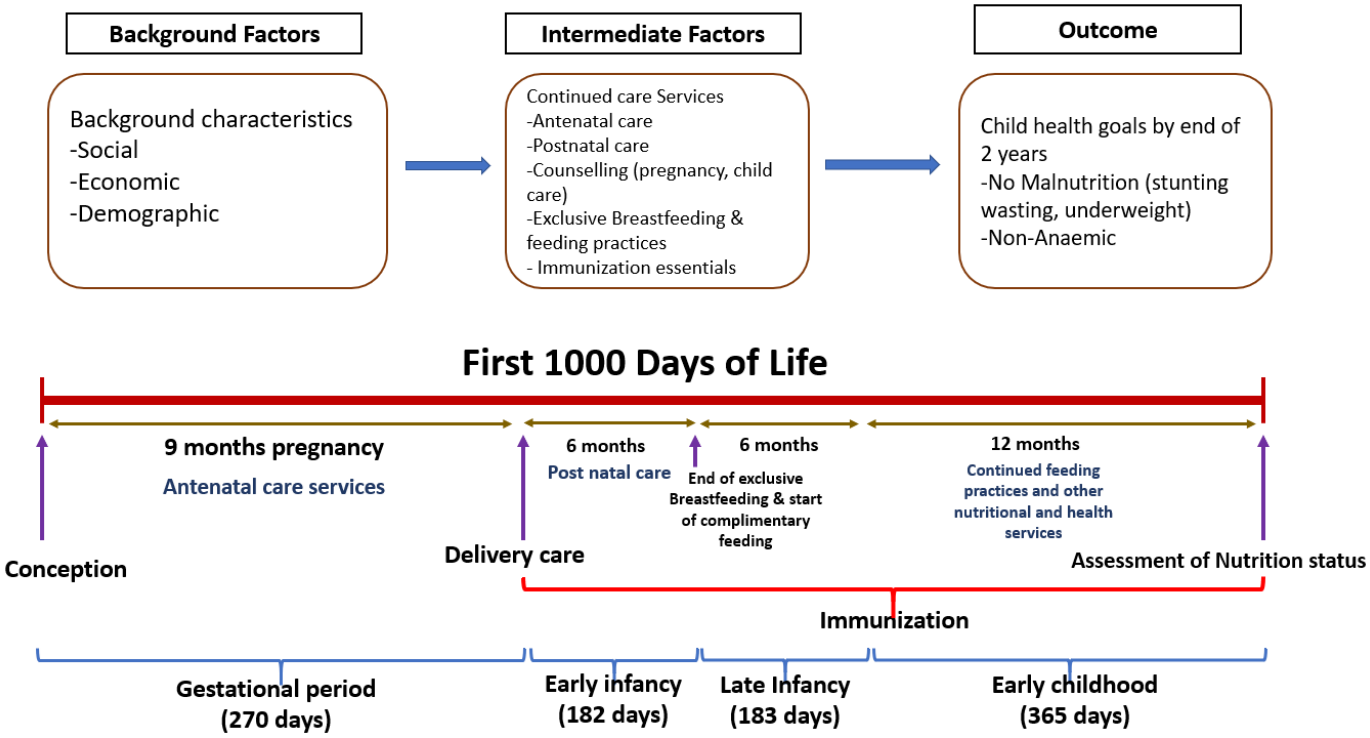
The relationship between a child's future health and its determinants can be comprehensively understood through various theoretical perspectives, including Barker's theory, the Life-course theory, the Fundamental-causes theory, and the First 1000 Days of Life approach (Barker et al., 2010; Fall, 2013; Kuh et al., 2003; Link & Phelan, 1995; R. E. Black et al., 2013; Wadsworth, 1997).

The Barker's theory highlights that the events during the intrauterine or early life phase have long term effects on morbidity and mortality from chronic diseases (Barker et al., 2010). During this critical phase, the nutritional and environmental conditions shape future risks for chronic diseases in adulthood. Building this understanding, the Life-course theory broadens the perspective by focusing on the cumulative risks for chronic diseases throughout the lifespan, which result from the interplay of environmental, social, and behavioural factors (Kuh et al., 2003). This theory emphasizes the interaction between biological and social factors across different life stages rather than focusing on a single period (Kuh et al., 2003; Wadsworth, 1997). For instance, biological factors such as low birth weight, when combined with poor socioeconomic conditions during early childhood, can significantly influence health outcomes in adulthood (Bartley et al., 1997). Shifting from these biological and life-stage perspectives, the theory of fundamental cause links social and economic status to various health outcomes, emphasizing the enduring influence of socioeconomic factors over time (Link & Phelan, 1995). This theory assumes that access to educational and financial resources, as well as the availability of services, can significantly shape the presence of risk and protective factors for diseases (Wadsworth, 1997). These theories align closely with the concept of the first 1000 days of life, a critical window spanning from conception to 24 months after birth, emphasizing the essential role of nutrition during this period (Fall, 2013). Nutritional deficits starting from the fetal stage and early life are associated with serious long-term consequences, including impaired cognitive performance and an elevated risk of chronic diseases (Black et al., 2013).

These theories serve as a basis for observing the current scenario of child health outcome from the conception point to 24 months. In India, there is a significant gap in research on the First 1000 Days of Life and ongoing care during this period affects child health. This study seeks to address this gap by examining the continuum of care during the First 1000 Days and its impact on child health.

Specifically, it will observe how integrated health, nutrition, and early childhood development interventions are implemented in India to improve maternal and child health outcomes. *(**Figure 1**)*

Figure 1. Conceptual framework of the study



Data and Methodology

Data source

The present study utilized the fifth round of National Family Health Survey (NFHS-5, 2019-21) for analysis. The NFHS is a large-scale, multi-round survey conducted in representative sample of household throughout India, by International Institute for Population Sciences. Due to the pandemic outbreak, NFHS was carried out in 707 districts in 2 phases-*Phase I* covered 17 states/union territories from 17th June 2019 to 30th January 2020; and *Phase II* covered 11 states/union territories from 2nd January 2020 to 30th April 2021. Total 17 field agencies, collected information from 636,699 households covering 724,115 women and 101,839 men (IIPS, 2021).

The sample was selected to assess the continuum of care services provided from conception through the first two years of life (0-23 months) and to evaluate the

associated health outcomes. The study included all children who had completed 1000 days, starting from conception to their second year of life, using data from the most recent birth records in the NFHS-5 individual file. The final sample comprised 88,026 children.

Variable description

Continuum of care: The 'Continuum of care' was measured as the care provided from conception to 2 years of a child's life, summing up to 1000 days. This variable was assessed using a scoring method based on the range of services received. In India, the care approach combines health, nutrition, and early childhood development interventions to improve maternal and child health. The final composite index, ranging from 0 to 36, was computed from these indicators. The Cronbach's alpha of 0.77 confirmed the index's reliability. The index was divided into three quantiles: low, moderate, and high, and each type of care was also categorized accordingly. ***(Table 1)***

Table 1. Indicators for measuring continuum of care in first 1000 days of life

Phase	Type of care	Services	Score
Gestational period	Antenatal care services	Four or more ANC visits Received protection against neonatal tetanus Received iron folic supplements Received nutritional supplements Received financial assistance Received benefits from Anganwadi on: health check-ups Received benefits from Anganwadi on: health and nutrition education Received advice on institutional delivery	0-8
	Delivery care	Institutional delivery During delivery, a disposal delivery kit was used After delivery, the baby was immediately wiped dry and wrapped without being bathed After delivery the baby was put to mother's chest and there was skin touch of the baby and mother	0-4
Infancy and	Postnatal care	During first two days, healthcare provider examined the cord	0-7

		During first two days, healthcare provider measured temperature During first two days, healthcare provider counselled on danger signs of newborn Received advice on cord care Received advice on keeping the baby warm Baby checked before discharge from place of delivery Baby checked after discharge from place of delivery	
	Breastfeeding practices	Received advice on breastfeeding During first two days, healthcare provider counselled on breastfeeding During first two days, healthcare provider observed breastfeeding Exclusive breastfeeding	0-4
	Complimentary feeding practices	Regularly received food from Anganwadi / ICDS Breastfeeding + water Breastfeeding + liquids Breastfeeding + solids	0-3
	Immunization essentials	Received all doses of: BCG Received all doses of: DPT Received all doses of: Polio Received all doses of: Hepatitis B Received all doses of: Measles Received all doses of: Vitamin A1 Received all doses of: Pentavalent Received all doses of: Rota vaccine Received all doses of: Japanese encephalitis Received all doses of: DPT Booster	0-10
	Other Post infancy care	Received any benefits on health and nutrition education Regularly go to Anganwadi/ICDS for early childhood care	0-2
	Composite index for Continuum of care		**0-36**

Child nutrition outcomes: The child nutritional health outcomes are stunting (height for age), wasting (weight for height), underweight (weight for age) and anaemia. ***Stunting*** reflects prolonged inadequate nutrition indicating long-term

malnutrition effects. Children whose height-for-age Z-score falls below minus two standard deviations (-2SD) from the reference population median are considered stunted, while those below minus three standard deviations (-3SD) are classified as severely stunted. ***Wasting*** assesses body mass relative to length, indicating current nutritional status. Children with a weight-for-height Z-score under minus two standard deviations (-2SD) are considered wasted, and those below minus three standard deviations (-3SD) are severely wasted. ***Underweight***, indicating protein-energy malnutrition, is defined by a weight-for-age Z-score below minus two standard deviations (-2SD), with severe underweight below minus three standard deviations (-3SD), as per WHO guidelines.

Background variables: The background variables include child's age in months (24-36, 37-48, 49-60), birth order of child (first, second, third, fourth or more), sex of child (male, female), mother's age at first birth in years (<20, 20-24, 25-29, >30), mother's level of education (no-education, primary, secondary, higher), religion (Hindus, Muslims, others), caste (scheduled caste/scheduled tribe, other-backward classes, others), wealth index (poorest, poorer, middle, richer, richest), residence (urban, rural), covered by health insurance (no, yes), and, mass media exposure (no exposure, partial exposure, full exposure).

Statistical analysis

Descriptive statistics for all the study variables have been carried out. Bivariate analysis was carried out, with cross-tabulations and a chi-square test of the association of continuum of care and background variables. In the current study, the outcome variable is "continuum of care" in an ordinal scale (i.e., 'Poor', 'Moderate', and 'Good'). Ordered logistic regression as part of multivariate analysis has been employed to examine the effect of continuum of care on child nutrition outcomes, controlling for background variables.

Let Y be the ordinal outcome variable, in this case it is the levels of continued care, and p_1, p_2, and p_3 be the proportions in each level, such as, 'poor', 'moderate' and 'good, respectively. The logarithm of odds are as follows:

Low, $\log\left(\frac{p_1}{p_2+p_3+p_4}\right)$, 0

Low or Moderate, $\log\left(\frac{p_1+p_2}{p_3+p_4}\right)$, 1

Low or Moderate or High, $\log\left(\frac{p_1+p_2+p_3}{p_4}\right)$, 2

The assumption of proportional odds, which means that all the independent variables have an identical effect at each category of the outcome variable, has been tested using the likelihood ratio test of proportionality. Test for the existence of multicollinearity was done with the help of variance inflation factor (VIF).

Suppose Y^* is the unobserved dependent variable

$$Y^* = x^T\beta + \varepsilon$$

where x is the vector of predictor variables, β is the vector of regression coefficients, and ε is the error term. Since, Y^* is unobserved, we observe the categories of responses

$$Y = \begin{cases} 0 & if\ Y^* \le \mu_1 \\ 1 & if\ \mu_1 < Y^* \le \mu_2 \\ 2 & if\ \mu_2 < Y^* \le \mu_3 \\ 3 & if\ \mu_3 < Y^* \end{cases}$$

Where μ_i's are externally imposed endpoints of the observable categories of the outcome variable. Then the ordered logistic regression model uses the observations on Y, which are a form of censored data on Y^*, to fit the parameter vector β.

We followed up by a logit regression model where the continuum of care predicts the child nutrition outcomes, controlling for the background characteristics.

Results

Sample characteristics

The sample consists of 41.63% children in the age-group 24-36 months and mostly of the second birth order (38.76%). The gender distribution is 55.85% boy and 44.15% girl child. The age of the mother is mostly in the range of 20 to 24 ages, around 47.8%. Most of the most mothers had completed secondary education (50.78%). Large proportion of the sample belongs to Hindu religion (79.71%), other backward classes (42.55%), rural areas (69.5%) and more or less evenly distributed across economic groups. Around 25.4% mothers had health insurance coverage and 67.63% had partial exposure to mass media. (**Table 2**)

Table 2. Description of the sample background characteristics, India (2019-21)

Background Characteristics		N	Percentage
Child's age	24-36	36,643	41.63
	37-48	27,614	31.37
	49-60	23,769	27.00
Birth order	First	26,095	29.64
	Second	34,116	38.76
	Third	15,504	17.61
	Four and more	12,311	13.99
Sex of child	Male	49,163	55.85
	Female	38,863	44.15
Mother's age at 1st birth	<20	30,324	34.45
	20-24	42,066	47.79
	25-29	12,639	14.36
	30+	2,997	3.40
Mother's education	No education	17,548	19.94
	Primary	10,749	12.21
	Secondary	44,701	50.78
	Higher	15,027	17.07
Religion	Hindu	70,168	79.71
	Muslims	13,705	15.57
	Others	4,152	4.72
Caste	SC/ST	27,657	31.42
	OBC	37,454	42.55
	Others	22,915	26.03
Wealth index	Poorest	18,772	21.33
	Poorer	17,955	20.4
	Middle	17,013	19.33
	Richer	17,486	19.86
	Richest	16,801	19.09
Residence	Urban	26,881	30.54
	Rural	61,145	69.46
Covered by health insurance	No	65,667	74.60
	Yes	22,359	25.4
Mass media exposure	No exposure	22,120	25.13
	Partial exposure	59,536	67.63
	Full exposure	6,370	7.24
Total		**88,026**	**100**

Continuum of Care in the first 1000 days of life

The continuum of care during the first 1000 days of life was low for approximately 35% of children, moderate for 34%, and high for 31%. ***(Figure 2)***

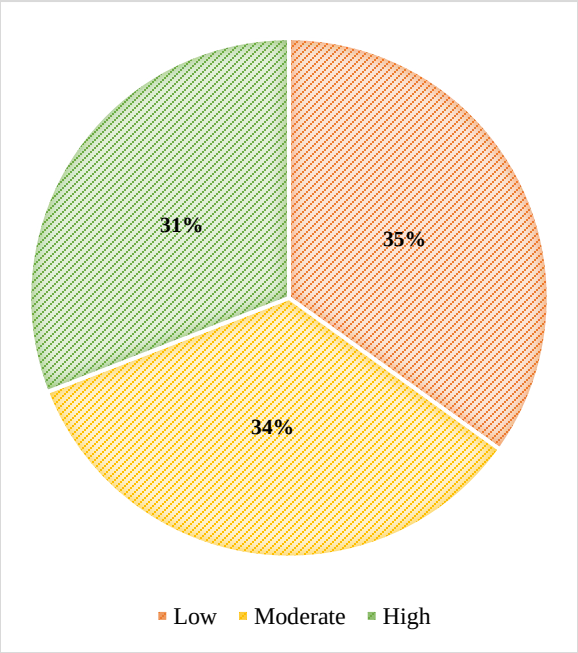


Figure 2. Percentage distribution of Continuum of care categories, India (2019-21)

Further, the continuum of care was good for first order children (23.07%), while poor for higher order children. There was no significant association of continuum of care with the sex of child. Mother's age at first birth showed a significant association, indicating higher ages at first birth having poor continuum of care while lower ages like 20-24 (22.63%) having good continuum of care. The continued care received was poor for mothers with no education (27.8%), and mother's education is significantly associated. The continuum of care was poor among Muslim women (25.27%), while good among Hindu women (22.82%), and moderate among other religion women (63.75%). Continued care is good among mothers covered by health insurance (25.74%) and having full exposure to mass media (24.19%). ***(Table 3)***

From Figure 3, the effect of each type of care on the child nutrition can be observed. Among the children who are stunted, the delivery care, postnatal care, complementary feeding, and immunization essentials were high percentage of low care. A similar pattern was observed for wasting, underweight and anaemia as well, thus indicating that low care in delivery, postnatal, feeding and immunization can affect child nutrition adversely. (**Figure 3)**

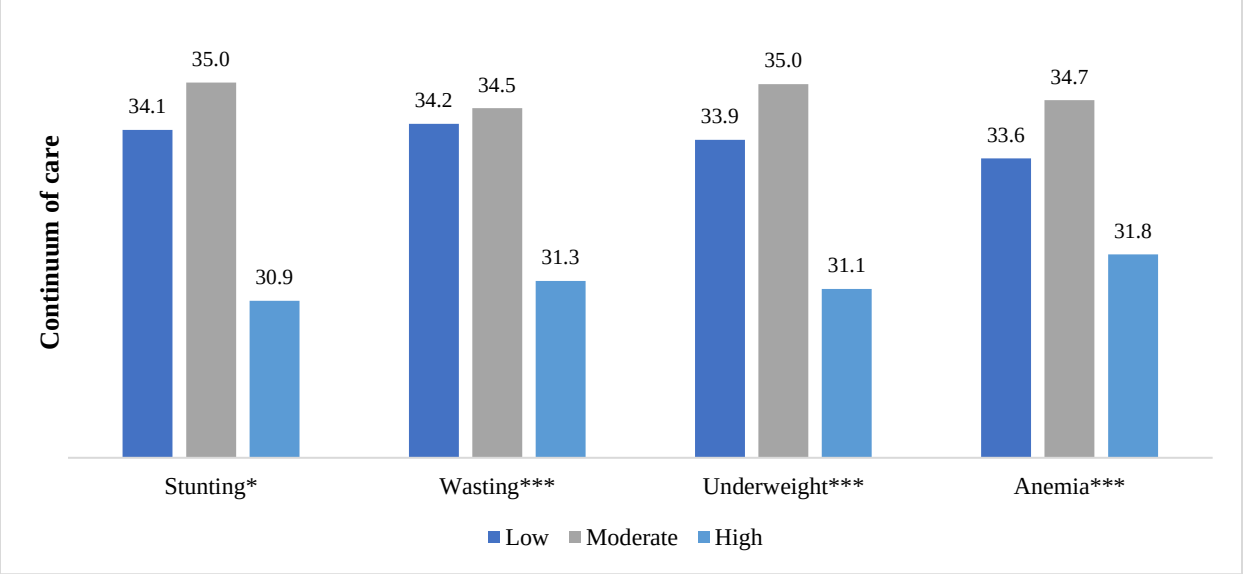
Table 3. Bivariate analysis of continuum of care with background characteristics, India 2019-21

Background variables		Continuum of care			χ^2 test
		Low	Moderate	High	p-value
Child's age	24-36	33.2	32.69	34.1	<0.001
	37-48	35.39	35.05	29.55	
	49-60	37.01	35.44	27.55	
Birth order	First	33.92	33.42	32.67	<0.001
	Second	31.84	34.91	33.26	
	Third	36.41	34.59	29.00	
	Four and more	43.7	33.23	23.06	
Sex of child	Male	35.04	34.28	30.68	0.095
	Female	34.77	34.04	31.19	
Mother's age at 1st birth	<20	35.59	34.8	29.61	<0.001
	20-24	33.09	34.32	32.59	
	25-29	37.94	32.78	29.28	
	30+	41.01	31.68	27.31	
Mother's education	No education	41.88	33.16	24.96	<0.001
	Primary	33.48	34.54	31.98	
	Secondary	30.35	35.15	34.5	
	Higher	41.43	32.18	26.39	
Religion	Hindu	33.31	34.00	32.7	<0.001
	Muslims	41.97	34.4	23.63	
	Others	38.87	36.46	24.67	
Caste	SC/ST	30.21	34.66	35.13	<0.001
	OBC	33.85	33.98	32.16	
	Others	42.35	33.91	23.75	
Wealth index	Poorest	37.21	33.71	29.09	<0.001
	Poorer	31.72	34.72	33.55	
	Middle	29.2	34.92	35.88	
	Richer	31.57	35.11	33.32	
	Richest	45.06	32.38	22.56	
Residence	Urban	43.48	31.25	25.27	<0.001
	Rural	31.15	35.46	33.38	
Covered by health insurance	No	37.49	33.63	28.88	<0.001
	Yes	27.36	35.79	36.85	
Mass media exposure	No exposure	42.44	32.75	24.81	<0.001
	Partial exposure	32.19	34.95	32.86	
	Full exposure	34.27	31.90	33.83	

Figure 3. Percentage distribution of a) stunting b) underweight c) wasting d) anaemia, among those who received each type of care and continuum of care, India (2019-21).

On observing the association of continuum of care with child nutrition outcomes, we infer that wasting, underweight and child anaemia is significantly associated with continued care provisioning during the first 1000 days of life. (**Figure 4**)

Figure 4. Percentage distribution of child nutrition outcomes according to continuum of care levels, India (2019-21)



The findings from ordered logit model taking the continuum of care as the dependent variable show the covariates' proportional odds ratio is significant across the ordered outcomes. With increasing birth order, the chances of getting better continuum of care decreases and change proportionally across the levels of the outcome variable (AOR: 0.88; p<0.001). The results show that mothers whose age at first birth was much younger such as 20-24, are more likely to have better continuum of care (AOR: 1.14; p< 0.001). Education was found to have a significant impact on the regression model. The proportional odds ratio is observed to increase with the increasing levels of mother's education. Similarly, the mothers who were covered by health insurance and had more exposure to mass media, the proportional odds ratio predicts higher chances of better continuum of care. (**Table 4**)

Table 4. Multivariable ordered logistic regression model output showing the socio-demographic characteristics of Continuum of care, India (2019-21)

Background Characteristics		AOR (95% CI)
Child's age	24-36 months *(ref.)*	
	37-48 months	0.8***(0.77,0.82)
	49-60 months	0.71***(0.68,0.73)
Birth order	First *(ref.)*	
	Second	1.01 (0.98,1.05)
	Third	0.88***(0.84,0.92)
	Four and more	0.7***(0.67,0.73)
Sex of child	Male *(ref.)*	
	Female	0.99 (0.96,1.01)
Mother's age at 1st birth	<20 years *(ref.)*	
	20-24 years	1.14***(1.1,1.17)
	25-29 years	1.12***(1.07,1.17)
	30+ years	1 (0.93,1.08)
Mother's education	No education *(ref.)*	
	Primary	1.21***(1.15,1.27)
	Secondary	1.21***(1.16,1.26)
	Higher	1.01 (0.95,1.07)
Religion	Hindu *(ref.)*	
	Muslims	0.69***(0.66,0.72)
	Others	0.26***(0.25,0.27)
Caste	SC/ST *(ref.)*	
	OBC	0.93***(0.89,0.96)
	Others	0.71***(0.68,0.74)
Wealth index	Poorest *(ref.)*	
	Poorer	1.05*(1,1.09)
	Middle	1.13***(1.08,1.19)
	Richer	1.16***(1.11,1.22)
	Richest	1.06 (1,1.12)
Residence	Urban *(ref.)*	
	Rural	1.44***(1.39,1.5)
Covered by health insurance	No *(ref.)*	
	Yes	1.55***(1.5,1.59)
Mass media exposure	No exposure *(ref.)*	
	Partial exposure	1.51***(1.45,1.56)
	Full exposure	1.7***(1.6,1.81)

Note: (ref.)- Reference category; *** p<0.001;** p<0.01; *p<0.05.

The child nutrition outcomes are predicted by the kind of continuum of care provisioned while controlling for the background factors. It is observed that there is an 11%, 16%, and 18% higher risk of wasting, underweight, and anaemia among the children if the continuum of care is poor in the first 1000 days of life. (**Table 5**)

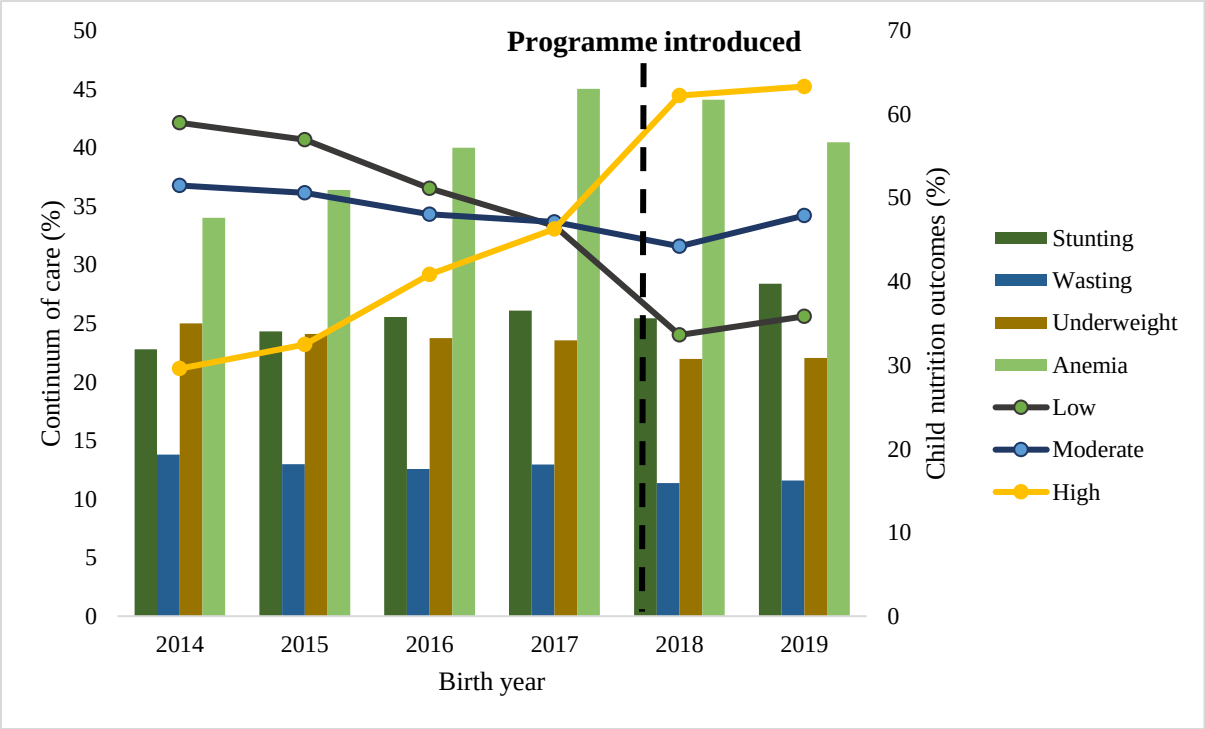
Table 5. Adjusted odds ratio and 95% confidence interval for the logit model

		Stunting	Wasting	Underweight	Anaemia
Continuum of care	Good *(ref.)*				
	Moderate	1.07 **(1.02,1.10)	1.08***(1.04,1.15)	1.14***(1.08,1.18)	1.11***(1.08,1.16)
	Poor	0.99(0.94,1.04)	1.11***(1.05,1.18)	1.16***(1.11,1.21)	1.18***(1.11,1.23)

Note: (ref.)- Reference category; *** p<0.001; ** p<0.01; *p<0.05

After introducing the first 1000 days programme in 2018 under RBSK, the continuum of care was observed to improve gradually. Though there was a reduction in child anemia post the program, there was no significant decline in the other malnutrition indicators. (**Figure 5**)

Figure 5. Percentage distribution of child nutrition outcomes across birth years, India (2019-21)



Discussion

This study examined the continuum of care, referring to the first 1000 days and its impact on children's overall well-being from conception until their second birthday. Our findings indicate that in India, a significant proportion of cases experience a poor continuum of care, which strongly predicts poor child nutrition outcomes (Chakrabarti et al., 2019). An observed association has also been identified between inadequate education, limited mass media exposure, lack of insurance coverage, and membership in minority groups. These findings align with global studies that catered to the reproductive, maternal, neonatal, and child health care continuum (Amouzou et al., 2019; Dasgupta & Chaand, 2018; Menon et al., 2019; Ravindranath et al., 2019; Vazir et al., 2013). Further, it is observed that women with higher education levels, elevated socioeconomic status, and urban residency are significantly more likely to utilize health and nutrition services throughout the continuum of care,(Ahmed et al., 2022; Ahmed et al., 2010; Langlois et al., 2015). This underscores the influence of education, economic stability, and urban infrastructure on healthcare access. This reflects the government programs' efforts to expand and create incentives for people to utilise the platforms, which were more likely to reach the more affluent group, however the reach of nutrition interventions remained an issue for all groups.

Community-based platforms in India hold the potential for delivering nutrition interventions during the last couple of decades, but coverage remains inadequate and uneven. Disparities are particularly pronounced among poorer, rural, less-educated populations and adolescent mothers. These gaps, influenced by factors such as women's age at first delivery and educational background,(Nguyen et al., 2021) reflect an expansion in basic program reach without effective integration of all interventions. With the gradual improvement in intervention reach and coverage, studies' estimations indicating that implementing nutrition interventions (such as iron pills distribution, nutrition, and breastfeeding counseling) consistently within the existing level of coverage would improve child health outcomes(Joseph et al., 2020). In this approach, it is worth to discuss that India has already developed many robust programs such as Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), National Nutrition Mission (NNM), and Anaemia Mukt Bharat (AMB) to improve maternal and child health indicators (*Anemia Mukt Bharat*, n.d.; *Home | NITI Aayog*, n.d.; *Pradhan Mantri Surakshit Matritva Abhiyan | PMSMA*, n.d.). Under the Pradhan Mantri Surakshit Matritva Abhiyan (Government of India, 2016) a fixed-day monthly event to give assured, comprehensive, and quality ANC to all

pregnant women at no cost has been done, and the ANC platform has received increased focus. The Anaemia Mukt Bharat plan has set goals for India to reduce anaemia among pregnant women from 50% in 2016 to 35% in 2022 by offering anaemia prevention services such as IFA distribution through routine and special ANC interactions (Government of India, 2019). The National Nutrition Mission, POSHAN Abhiyaan, (Government of India, 2018) intends to address malnutrition in a mission-mode by boosting implementation of essential health and nutrition treatments and improving several societal factors.

This study represents a pioneering exploration of the continuum of care during the First 1000 Days of life, central to the 'Paalan 1000 - Journey of the First 1000 Days' program. This initiative, which integrates early childhood coaching with essential family support services, aligned with the Rashtriya Bal Swasthya Karyakram (RBSK), highlights the critical role of caregivers (Government of India, 2022) By addressing specific needs and promoting equitable access, the continuum of care approach facilitates high-quality support for vulnerable groups, fostering long-term well-being and reducing risks of mortality, morbidity, and future health challenges. Thus, the continuum of care approach in the first 1000 days of life, must include the components that work together to support optimal child health.

The study has several strengths owing to the large-scale national representative data used that provides rich data on the several services received during the whole 1000-day period and enables the application of techniques to compute the continuum of care. Additionally, this study provides a base to carry out further research in tracking the continued care provisioning and evaluate the 1000 days programme regionally. Besides, the current study has some limitations as well, especially owing to the cross-sectional nature of the study, that's why it cannot establish any causality. There could be recall biases in the responses of services received and thus cause measurement error in the continuum of care index. Though the study has tried to control for maximum background characteristics, but however there can be further adjustments required. Overall, this study has made a decent attempt at assessing the plausible association of a continuum of care in the first 1000 days program with child health outcomes.

Conclusion

This study is one of the first to comprehensively attempts to examine the continuum of care during the crucial first 1000 days of life, aligning with the 'Paalan 1000 – Journey of the First 1000 Days' initiative. This program emphasizes early cognitive development by providing tailored support to parents, families, and

caregivers. The initiative is integrated with the Rashtriya Bal Swasthya Karyakram (RBSK) mission, underscoring the importance of responsive caregiving and early interventions (Government of India, 2022).

To ensure vulnerable populations receive effective care throughout this critical period, several targeted strategies are essential:

- Develop and implement outreach initiatives to identify and serve low-income families, marginalized communities, and rural populations.
- Create educational materials and campaigns that communicate the significance of the first 1000 days, nutrition, immunizations, and early childhood development, tailored to the needs of diverse communities.
- Enhance the capacity of healthcare facilities to deliver quality prenatal and early childhood services, ensuring the availability of trained personnel, essential medicines, and appropriate equipment.
- Introduce financial assistance programs, such as conditional cash transfers, to alleviate economic burdens and promote health and nutrition behaviours.
- Engage trained health professionals or volunteers to provide personalized care, home visits, and support to navigate healthcare systems and overcome barriers.

By addressing these critical needs and promoting equitable access to healthcare and developmental services, the continuum of care approach can effectively support vulnerable groups. This integrated strategy not only meets immediate health requirements but also establishes a foundation for lifelong well-being, reducing mortality, morbidity, and future health challenges.

Declarations

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Ethical declarations

The present study utilizes a secondary dataset available in the public domain for legitimate research purposes with no identifiable information on the survey participants. Hence, there is no requirement for any additional ethical approval.

Consent for publication

Not applicable. No details, images or videos related to individual participants were obtained. In addition, data are available in the public domain.

Competing interests

The authors declare no competing interests.

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