Anaemia and Nutritional Status of Adolescent girls and Policy interventions in India: A Roadblock for Sustainable Development

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ABSTRACT

Thesis Statement: National and international policy documents have consistently placed a premium on adolescent nutrition improvement. While the health and well-being of children aged 14 to 19 is a critical indicator of a country's economic growth, the same is always argued to be even more so for females of the same age. Malnutrition's detrimental effects on young females aged 14–19 is of particular concern to health planners.
Methodology: Using data from the NFHS-03 (2005–06), NFHS-04 (2015–16), and NFHS-05 (2019-20) surveys, the current study examines the impact of two key policies, the Rashtriya Kishor Swasthaya Karyakram (2019-20) and the Adolescent Reproductive and Sexual Health Program (2005–2014) on the health status of adolescent girls.
Results: The study found a strong link between adolescent nutritional and anaemic status, teen pregnancy, and child marriage. Additionally, the disparity between resources allocated and expenditure under Rashtriya Kishor Swasthaya Karyakram has a detrimental effect on the nutritional status of adolescent girls in Indian states.
Conclusion and implications: Given that, despite legal interventions, child marriage and teenage pregnancy continue to occur in Indian states, policy interventions and serious implementation become essential for not only improving the health of the female cohort, but also for the future well-being of the next generation. Literacy levels of women and their anaemic status bear a significant negative correlation. Not just the literacy levels, but longer the time the girls have attended school also has a significant negative impact on their anaemic status. Thus, literacy and health and wellbeing of adolescent Indian women bear a significant relationship and poses to be two sides of a coin.

Keywords: *Adolescent girls, Adolescent Reproductive and Sexual Health Program, Anaemia, Nutrition, Sustainable development goals*

1. Introduction: Adolescent Health Conundrum

Hunger eradication and improved health and well-being are regarded as intrinsic to humanity, so much so that the United Nations has designated them as Sustainable Development Goals. (United Nations, 2016). The nutritional status of an individual is the primary determinant of his or her health and well-being. India is making steady progress toward food security but is far from achieving nutritional security. The country's Comprehensive Socioeconomic and Demographic Report Card-the National Family Health Survey (NFHS-5)-indicates a slight improvement in other health indicators but a spike in the incidence of anaemia across all age groups (International Institute for Population Sciences (IIPS), 2019). India is also lagging in meeting the six global nutrition

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targets set by the World Health Assembly in 2012 as part of the Comprehensive Implementation Plan on maternal, infant, and young child nutrition (Initiatives, 2020).

It is pertinent to mention here that India ranks 130 out of 191 countries in the Global Hunger Index (Klaus von Grebmer, Jill Bernstein, Miriam Wiemers, Tabea Schiffer, Asja Hanano & Réiseal Ní Chéilleachair, Connell Foley, Seth Gitter, Kierstin Ekstrom, 2021). The adage 'Health is Wealth' albeit never suffered from redundancy, has found a renewed sense of relevance in India, which is rich in human resources quantitatively but poor in terms of health quality. The health and wellbeing of the population have an overarching effect on various other spheres of development. It can be incontrovertibly stated that the better nutritional status of the population contributes to faster economic growth. (Wang & Taniguchi, 2002). There is a direct correlation between the population's health status and their educational attainment, labour productivity, savings, and investment, as well as their demography. Thus, health status, which is dependent on nutritional status, has the potential to propel a nation's economic growth. A person's poor health can trap them in a vicious cycle of poverty. As with other issues of inequality, this vicious cycle of poverty caused by malnutrition takes on frightening proportions for women.

Nutritional requirements vary according to age, gender, and additional factors such as occupation, rural/urban location, and so on. Female adolescents' nutritional requirements are considered to be the highest of all age groups (Ebenezer Goodman Ashie Nikoi, 2011). Adolescent females acquire 50% of their adult bone mass during this period and reach peak bone mass on average at the age of 20 (World Health Organization, 2002). They are highly susceptible to anaemia and other micronutrient deficiencies due to the high nutritional requirements during adolescence owing to the rapid physiological growth and development (Premalatha et al., 2012). Moreover, marriage at pre-mature age (below 18 years) which is prevalent in most of the developing countries further aggravates the physical, social and health issues of the adolescent girls (Hamed & Yousef, 2017). Research from both the developing and developed worlds indicates that girls who marry early are more likely to experience domestic abuse and a variety of health problems, including anaemia, depression, and anxiety (Jensen & Thornton, 2003). Early pregnancy is a serious public health concern due to its potential impact on maternal and child health (Chaturvedi et al., 1994; Le Strat et al., 2011). Pregnancy during adolescence increases the risk of multitude of health complications, including anaemia, preterm labour, hypertension, maternal death, perinatal, neonatal death, and low birth weight (Kozuki et al., 2012; Tiruneh et al., 2021). Additionally, pregnancy and the ensuing lactation during the early stages of gynaecological development depletes the micronutrients such as iron and further increase the risk of anaemia in underaged mothers (Rah et al., 2008b). Maternal anaemia is an important global health problem that affects about 500 million women of reproductive age (Stevens et al., 2012; Young, 2018). The early marriage and childbearing also have a negative effect on the adolescent nutritional status by lowering their educational attainment and employment status, which results in lower-income, decreased autonomy, and increased fertility, all of which have a negative impact on nutritional purchasing power, nutritional intake, and other outcomes.

A growing emphasis has been placed on adolescent health and well-being in recent years, owing to the sheer number of adolescents and the demographic weight they hold, particularly in developing countries (M. B. Id et al., 2020). As a result, Asia accounts for

more than half of the world's adolescents, while according to the 2011 Census, adolescents account for 20% of India's population (*Office of Registrar General and Census Commissioner India. Population Enumeration Data (Final Population). 2015*, n.d.; *UNICEF. Adolescent Demographics–UNICEF Data. 2016*, n.d.). In terms of sheer numbers, South Asia has more adolescents than any other region, with nearly 350 million. With over 300 million people, East Asia and the Pacific are the next largest regions. In either of these regions, the adolescent population dwarfs that of any other region on the planet. Despite this, adolescents make up the largest proportion of the population in Sub-Saharan Africa, accounting for 23% of the region's population aged 10–19 (*UNICEF. Adolescent Demographics–UNICEF Data. 2016*, n.d.). It is a key decade in the life course with implications on adult health, socio-economic well-being of a country and even the health of the future children. Adolescents comprise 16% of the total world population At the turn of the century, the UNICEF Executive Director emphasized the importance of adolescents as a necessary force for social change (World Health Organization, 2002).

The Present Study

Earlier studies (Paul, 2018; Paul, 2020) have identified anaemia among the adolescent girls in India as an indicator of their poor health and have pointed at the associated issues of infant mortality, maternal mortalitybut the current study establishes a relationship between variation in state's budget and expenditure in *Rashtriya Kishori Swasthya Karyakram (RKSK)-*Adolescent Health Care Programme and the anaemic status of adolescent girls in India. The present study underlines the following objectives-

- To examine the trend in adolescent girls' nutritional status as measured by anaemia over two time periods, 2019-20 [NFHS 5] and 2015-16 [NFHS 4], across India's states and union territories.
- To examine the prevalence of anaemia in adolescent females against the backdrop of each state's social milieu.
- To examine the relationship between States' budget and expenditure gaps under RKSK and adolescent girls' anaemia.

Methods

Bivariate analysis was conducted to ascertain the relationship between selected socioeconomic variables and adolescent health status as measured by anaemic status.

Sample Design and Data Sources:

Data used for the study are from the 2015–16 and 2019-21 National Family Health Survey (NFHS) - a nationally representative sample survey. NFHS-4 (2015-2016) collected information for 699,686 women aged 15–49 years and 112,122 men aged 15–54 years and 601,509 households, based on population and housing census of India, 2011. NFHS-5 (2019-2021) collected information from 636,699 households, 724,115 women, and 101,839 men. These surveys adopted stratified two-stage sampling design to collect sample consisting of 28,586 clusters (2015-16); 8397 in urban, 20,059 in rural, and 130 from slums list provided by Municipal Corporation Offices (MCOs). The selection of clusters was done using probability proportional to clusters size in the first stage, while in the second

stage, using an equal opportunity systematic selection 22 households from each cluster were selected. A detailed description of sampling procedure and survey design is given in the India report of NFHS–4 and NFHS-5 India report.

2. Policy Interventions on Adolescent Nutritional Status in India

Malnutrition has been recognized as India's primary health problem in recent decades, but the nation's struggle with malnutrition and diet dates back to the nation's infancy (Arnold, 1994; Hong et al., 2021). Poverty and hunger played a significant role in the majority of diseases that afflicted India during the colonial era. Dadabhai Naoroji's research, which drew on data from prisons, emigration authorities, and other colonial sources, brought to light the impoverished state of the Indian masses, who did not receive enough to meet their basic needs (Dadabhai Naoroji, 1901). According to J.W.D. Megaw, Director General of the Indian Medical Service in the early 1930's, only 39% of the population was adequately nourished, 41% were inadequately nourished, and 20% were "extremely inadequately nourished." The majority of the population suffered from severe vitamin deficiencies as a result of protein- and vitamin-deficient diets (Arnold, 1994, 2010). Inadequate diets have been linked to anaemia in women of reproductive age and during pregnancy since the 1930s (Balfour, 1936).

The undernutrition of the population has always been a major focus of the various five-year plans. Undernutrition has been described as a health problem (1950–65), a food shortage problem (1965–75), a multifaceted poverty challenge (1975–97), and a nutrition and food security problem (after 1997). India, as a welfare state, has a primary responsibility to improve its people's nutrition and standard of living, as well as public health, under Article 47 of the Indian Constitution. Various policy measures have been developed in response to this directive to address malnutrition in general and anaemia in particular among adolescent girls. The government of India and other charitable organizations have made it one of the country's primary public health concerns.

The National Nutrition Policy of India (1993) was formulated against a backdrop of endemic malnutrition and ill health that plagued the country. Women and children were considered to be the most nutritionally fragile and vulnerable group. Economic development and food sufficiency at the household level do not ensure uniformly stable and satisfactory nutritional status for all members (Aubel et al., 2021). As a result, the need to address the nutrition need of respective members especially girls and women independently became apparent. Iron deficiency or nutritional anaemia in pre-school children, pregnant women, and nursing mothers was one of the issues identified by this policy. Iron deficiency in adolescent girls was identified, and the government's initiative to include adolescent girls within the scope of ICDS was stepped up to prepare them for safe motherhood. It was decided that ICDS must cover all adolescent girls from poor families until the year 2000. (Ministry of women and child development, 1993). It recommended initiating iron supplementation in adolescent females, monitoring them regularly, and providing nutrition education. Iron-fortified salt was introduced as a pilot project in the states of Tamil Nadu and Rajasthan (Ministry of women and child development, 1993)

The Ministry of Women and Child Development launched the Kishori Shakti Yojana (KSY) in 2000, utilising Integrated Child Development Services (ICDS). Its objective was to improve the nutritional and health status of girls aged 11–18 years, to equip them with home-based and vocational skills, and to promote their overall development, including health, nutrition, and family welfare awareness. Similarly, the Nutrition Program for Adolescent Girls (NPAG) was launched as a pilot project in 51 identified districts to address the issue of adolescent girls malnutrition. It provided underweight adolescent girls with 6 kg of free food grains per month. Due to insufficient financial resources and coverage, the Kishori Shakti Yojana and the National Program for Adolescent Girls were unable to have the desired impact on adolescent girls' health (Narayan et al., 2018). As a result, the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG)-SABLA was introduced to address the multifaceted problem of adolescent girls. It was initially approved by the government on a pilot basis in 200 districts. In the selected 200 districts, the SABLA supplanted the existing Nutrition Program for Adolescent Girls (NPAG) and Kishori Shakti Yojana (KSY), while KSY continued to operate in the remaining districts. SABLA aims to empower adolescent girls aged 11 to 18 years old by enhancing their nutritional and health status, as well as their home,life and vocational skills. Its objective is to integrate out-of-school females into formal or non-formal education. It was implemented through the Integrated Child Development Service scheme, with Anganwadi Centres serving as the hub for service delivery. Among the numerous objectives it sought to accomplish was the improvement of nutrition and health status (Guidelines, n.d.; Ministry of women and child development, 2010).

This programme included both nutritional and non-nutritional components. Under the Nutrition component, out-of-school Adolescent Girls aged 11-14 years who attend Aanganwadi Center and all girls aged 14-18 years receive Supplementary Nutrition containing 600 calories, 18-20 grammes of protein, and micronutrients on a daily basis for 300 days per year. (Ministry of women and child development, 2010). The non-nutritional component met the developmental needs of adolescent girls aged 14-18 years by providing IFA supplementation, health screening and referral services, nutrition and health education, ARSH counseling/guidance on family welfare, and life skills.

The funds released to states/UTs under the SABLA scheme in 2014-15 totaled Rs 61021.36 lakhs, with Rs 58498.58 lakhs being utilised. To date, a total of Rs 27486.79 lakhs has been released to states under SABLA, with Rs 7844.49 lakhs being utilised. The scheme benefitted a total of 10228911 individuals in 2014-15 and 4868553 individuals in 2015-16. Due to the success of this pilot programme, it was expanded to include an additional 303 districts in 2017-18. (Ministry of Women and Child Development, 2017). SAG ultimately took the place of KSY in these newly identified districts. SAG/SABLA was expanded to all districts in the country during the third phase (2018–19), and KSY was completely phased out.

Table 1: Budget Allocation and Utilisation under SABLA from 2015-18

Year	Allocation	Nutrition		Non-Nutrition	
(Rs. in crore)		Released	Utilized	Released	Utilized
2015-16	BE:75.5 RE: 475.5	450.7	474.27	19.7	20.23
2016-17	BE: 460 RE:510	467.44	364.22*	09.55	11.97*
2017-18	BE: 460	408.41	117.17	23.31	2.34

BE- Budget Expenditure, RE- Revenue Expenditure
Source: Demands for Grant, Ministry of Women and Child Development (2018-19)

Table 2: Number of Beneficiaries under SABLA from 2015-18

Services	Number of beneficiaries (in lakh)		
	2015-16	2016-17	2017-18 (as on 30.11.2017)
Nutrition	110.03	107.02	82.50
IFA	**48.56**	**43.39**	**21.87**
Health check-up & referrals	34.94	32.75	14.03
Nutrition & Health Education	37.70	39.13	16.96
Counseling on Family Welfare & ARSH services	30.69	30.53	14.66
Life skill Education	23.72	24.47	8.85
Accessing Public Services	17.54	15.79	4.55
Mainstreaming out of school adolescent girls	0.52	1.30	NR
Vocational Training	1.08	2.05	0.27

Source: Demands for Grant, Ministry of Women and Child Development (2018-19)

Adolescent Reproductive and Sexual Health Program (ARSH)

In 2005, the Indian government launched the Adolescent Reproductive and Sexual Health Program to improve adolescents' health and well-being. The importance of influencing adolescents' health-seeking behaviour was recognized because their health status is critical in determining the country's health, mortality, morbidity, and population growth scenarios. Alternatively, because they are a valuable resource to the country, this group will assist in realizing the demographic bonus. ARSH was later absorbed into RKSK, which was launched in 2014. RKSK's mission is to improve the health and well-being of children and adolescents through a life-stage approach.

Rashtriya Kishor Swasthya Karyakram (RKSK) or National Adolescent Health Strategy was launched in 2014 to assist adolescents in realizing their full potential in making informed and responsible decisions about their health and well-being. The strategy targeted all adolescents aged 10–19 years, males and females, urban and rural, in school and out of school, married and unmarried. This program's specific goals are to improve nutrition, promote sexual and reproductive health, improve mental health, prevent injuries and violence, prevent substance abuse, and address non-communicable diseases. It aims to improve nutrition by reducing the prevalence of malnutrition and iron deficiency

anaemia. The programme provides for the promotion of adolescent-friendly services, the enhancement of adolescents' knowledge and attitudes toward health and nutrition, and the reduction of communicable disease burden. Weekly iron and folic acid supplementation (WIFS) and biannual deworming have been proposed to be implemented through school health programmes to address the high prevalence and severity of anaemia in adolescent girls and boys. All adolescent boys and girls in grades 6 to 12 enrolled in government, government-aided municipal schools, and out-of-school adolescent girls will receive weekly iron and folic acid (IFA) supplements under the supervision of a physician (Ministry of Health and Family Welfare, 2018).

3. Trends and Spatial Patterns of Health and Nutritional Status of Adolescent girls in India

The NFHS-4 and NFHS-5 databases were used to collect data on anaemic adolescent women in India. Our outcome variable was female adolescent anaemia, which was caused by an iron deficiency. To gain a better understanding of trends in adolescent girls' interconnected health and socioeconomic issues, child marriage, teenage pregnancy, and adolescent fertility rates were selected as indicators (Figure 1). It has been established through numerous studies conducted throughout the world that early marriage and early or adolescent childbearing are major causes of a variety of social, physical, and health problems (Gautam et. al., 2021) and are prevalent in several developing countries. It also has a far-reaching effect on the adolescent nutritional status by lowering their educational attainment and work status, which results in decreased work participation, work status, and ultimately female wellbeing. (Tiruneh et al., 2021; Das et al., 2023).
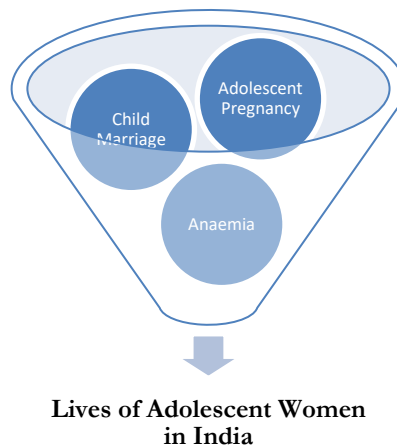

**Lives of Adolescent Women
in India**

Figure 1: Lives of Adolescent women in India (Source: Author)

For the last 15 years, The prevalence and severity of anaemia have decreased across all age groups, NFHS 4 (2015-16) registering a 2% decline from NFHS-3 (2005-06) (Alvarez-uria et al., 2014; Gupta et al., 2021; Kalaivani & Ramachandran, 2018). However, there has been an upsurge in the prevalence of anaemia amongst adolescent girls by 5% from NFHS 4(2015-16) to NFHS-5(2019-20) (Figure 2). According to the National Family Health

Survey-5, 59.1 percent of adolescent girls in India are anaemic (Arup Jana, 2020). A rise in anaemia among adolescent girls has been observed in all states except a few such as Andhra Pradesh, Delhi, Haryana, Kerala, Sikkim, Uttar Pradesh, Uttarakhand, Tamil Nadu, and Union Territories such as Andaman and Nicobar, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, and Lakshadweep. However, some states such as Chattisgarh, Odisha, Rajasthan, Assam, Mizoram, Tripura, Goa, and Gujarat and Union territories of Jammu and Kashmir and Ladakh have seen a steep increase in the incidence of anaemia among adolescent girls (Figure 2). As per NFHS-5, sixteen states had higher proportion of adolescent anaemic girls (Figure 2).
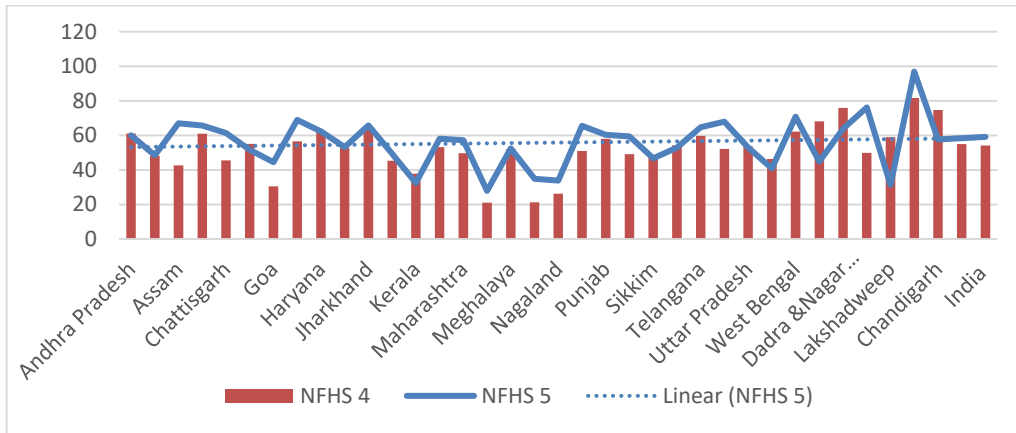

Figure 2: India: All Anaemic Women aged 15-19 years

Child Marriage

According to NFHS-5, 23.3 percent of women in the age group 20-24 married before reaching the age of 18 in India. Between NFHS-4 and NFHS-5, the overall number of women who married before reaching the age of 18 decreased by 3.5 percent on a national level. All the states except for Assam, Punjab, and Tripura, all states have seen a decline in the rate of underage girl marriage. States of Karnataka, Meghalaya, West Bengal, Andaman and Nicobar, Daman and Diu, Dadra and Nagar Haveli have shown either stagnant or a marginal decrease in the percentage of women in the age group 20-24 years who were married before the age of 18 years. West Bengal (41.6%), Bihar (40.8%), and Tripura (40.1%) had the highest rate of child marriages in the NFHS-5. Ten states are performing worse than the national average figure (Figure 3).

Teenage Pregnancy

According to the NFHS-5, 6.8 percent of women aged 15–19 were already mothers or pregnant at the time of the survey. This is a decrease from 7.9 percent of women who were already mothers or pregnant at the time of the NFHS-4 (2015-16). During the NFHS-4 survey years, eleven states had a higher percentage of women in the age group 15–19 who were mothers or pregnant than the national average. Eight states had a higher proportion of women in the age group 15-19 years who were mothers or pregnant at the time of the survey than the national average. In some states, including Andhra Pradesh,

Delhi, Himachal Pradesh, Manipur, Punjab, Tamil Nadu, Tripura, and Puducherry, teen/adolescent pregnancy increased marginally. Tripura and West Bengal are the states with the highest rates of adolescent/teen pregnancy during both NFHS-4 and NFHS-5. Between NFHS-4 and NFHS-5, Tripura had the highest increase in the percentage of women in the age group 15-19 years who were pregnant or mothers.

The term "Adolescent Fertility Rate" refers to the total number of births per 1,000 15–19-year-old females. The fertility rate of adolescents in India has decreased from 51 in 2015-16 to 43 in 2019-20. In comparison to the NFHS 4 data, all states have seen a decline in adolescent fertility rates, except for Meghalaya, Puducherry, and Punjab, which have seen a slight increase. Tripura, West Bengal, and Bihar have the highest AFRs at 91, 81, and 77, respectively (Figure 4).
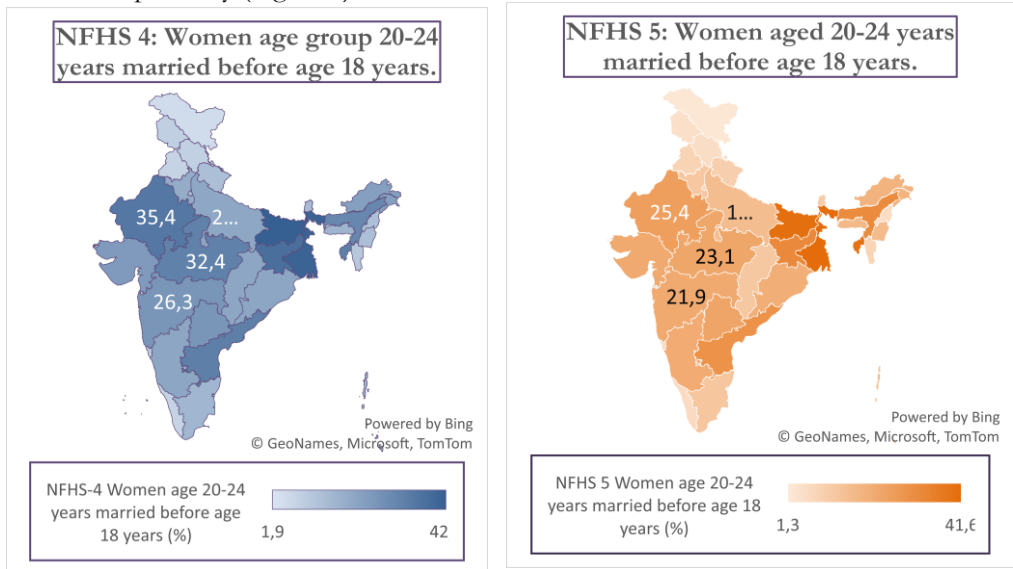

Figure 3: Women aged 20-24 years who got married before 18 years of age.
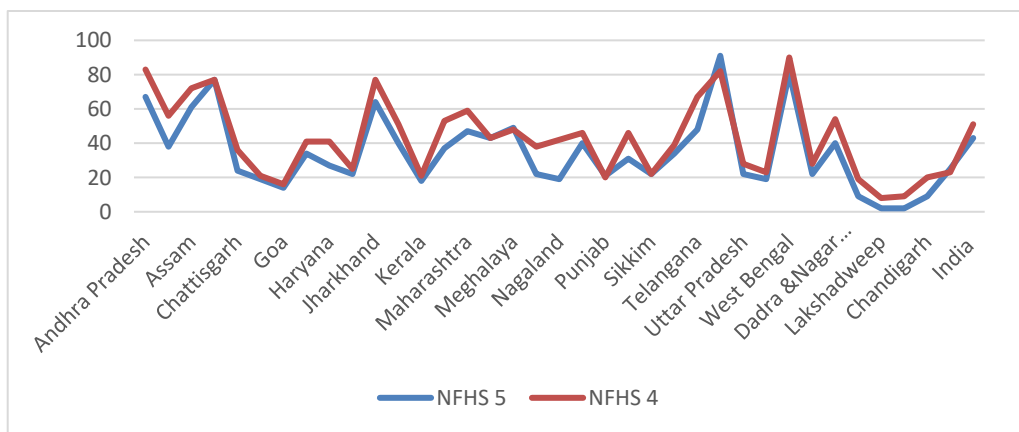

Figure 4: Adolescent Fertility Rate

Anaemia in adolescent girls is exacerbated by child marriage and subsequent pregnancy (teenage), or teenage pregnancy forces a girl into a vicious cycle of nutritional deprivation, one of which is anaemia.(Johnson, 2011;Pratinidhi A. et al, 1990). According to NFHS-5 data, there is a very weak positive correlation between anaemia and child marriage (0.366), teenage pregnancy (0.223), and adolescent fertility rate (0.276). States such as Bihar, Tripura and West Bengal thar report high rates of underaged marriage, adolescent pregnancy, and adolescent fertility, also have the highest rates of anaemia among adolescent girls. While Kerala has one of the lowest rates of anaemic girls aged 15–19 years at 32.5 percent (surpassed only by Lakshwadeep), it also has a low rate of child marriage (6.3 percent), teenage pregnancy (2.4 percent), and adolescent fertility (18).

When data are analysed spatially, they reveal a core of states that perform poorly in terms of adolescent girls' health and nutritional status. Six states perform below the national average on all four selected indicators of adolescent girls' health and well-being.

Table 3: Selected Indicators: Performance of Indian States

	All Women aged 15-19 years who are anemic	Adolescent Fertility Rate	Women aged 15-19 years who were already mothers or pregnant at the time of the survey (%)	Women aged 20-24 years married before age 18 years (%)
National Average	59.1	43	6.8	23.3
States performing poor than the national average	Gujarat, Haryana, Jharkhand, Odisha, Punjab, Rajasthan, Telangana, Tripura, West Bengal, Dadra, and Nagar Haveli, Daman and Diu, Jammu and Kashmir, Ladakh, Andhra Pradesh, Assam, Bihar	Andhra Pradesh, Assam, Bihar, Jharkhand, Meghalaya, Telangana, Tripura, West Bengal, Manipur, Maharashtra.	Andhra Pradesh, Jharkhand, Tripura, Maharashtra, Manipur, Odisha, West Bengal, Meghalaya.	Andhra Pradesh, Assam, Bihar, Jharkhand, Rajasthan, Telangana, Tripura, West Bengal, Dadra and Nagar Haveli, Daman and Diu.
The top Priority States	**Jharkhand, Tripura, West Bengal, Andhra Pradesh, Assam, Bihar**			

Top-five states	Manipur, Lakshwadeep, Kerala, Nagaland, Mizoram.	Lakshwadep, Ladakh, Chandigarh, Goa, Kerala.	Ladakh, Chandigarh, Jammu and Kashmir, Lakshwadeep, Kerala	Lakshadweep, Ladakh, Jammu and Kashmir, Himachal Pradesh, Nagaland.
Worse-five states	Ladakh, Jammu, and Kashmir, West Bengal, Tripura, Jharkhand.	Tripura, West Bengal, Bihar, Andhra Pradesh, Jharkhand.	Tripura, West Bengal, Andhra Pradesh, Assam, Bihar.	West Bengal, Bihar, Tripura, Jharkhand, Assam.

Jharkhand, Tripura, West Bengal, Andhra Pradesh, Assam, and Bihar are the states with the lowest performance, dubbed "top priority states." Two of these states are Empowered Action Group (EAG) states, which the Indian government has designated as having a special priority for social development. These two states are located in the country's northeast region.

4. Trends and Spatial Patterns of Health and Nutritional Status of Adolescent girls in India: Examining the correlates

Numerous studies have demonstrated an association between literacy, educational attainment, and nutritional status (Das et al., 2022; Nguyen et al., 2019; Ghosh et al., 2020). It has been established that demographic segments of the population with low educational levels are more vulnerable to malnutrition and related diseases due to their lack of knowledge about proper behaviour, consumption, and biomechanical function. Awareness and education both contribute to a decrease in the prevalence of anaemia. (Mehrotra et al., 2018). Morsy and Alhady made a similar observation, examining that women with a higher education were less likely to be anaemic than women who were illiterate or had only primary or secondary education (Morsy & Alhady, 2014). The scientific literature on health inequalities has repeatedly demonstrated a strong correlation between lower educational attainment and poorer health outcomes in different parts of the world (Adler & Newman, 2002; Dalstra et al., 2005; Mackenbach et al., 2008; Van Der Heide et al., 2013).

To investigate the factors affecting the health, nutrition, and well-being of adolescent girls in India, the following indicators of women's literacy and education status were chosen: Women's literacy rate, percentage of women with at least ten years of education, and female population aged six years and older who have ever attended school.

Table 4: Correlation matrix: Selected Indicators

	All Women age 15-19 years who are anemic	Adolescent Fertility Rate	Women age 15-19 years who were already mothers or pregnant at the time of the survey (%)	Women age 20-24 years married before age 18 years (%)	Women who are literate	Women with 10 or more years of schooling	female aged 6 years and above who ever attended school
All Women age 15-19 years who are anemic	1						
Adolescent Fertility Rate	0.2749862	1					
Women age 15-19 years who were already mothers or pregnant at the time of the survey (%)	0.222461	**0.948309**	1				
Women age 20-24 years married before age 18 years (%)	0.36445074	**0.93713456**	**0.84348279**	1			
Women who are literate	**-0.5687**	**-0.4530**	-0.28151	**-0.6247**	1		
Women with 10 or more years of schooling	**-0.44930**	**-0.69435**	**-0.61286**	**-0.78373**	**0.721191**	1	
Female aged 6 years and above who ever attended school	**-0.63561**	-0.35419	-0.17299	**-0.49768**	**0.933555**	**0.620878**	1

To ascertain the effect of women's literacy and education status on the health, nutrition, and well-being of adolescent women in India, a correlation was calculated. Women's literacy levels and duration of schooling are major determinants of adolescent women's health, nutrition, and well-being in India. There is a significant negative correlation between anaemic women aged 15-19 and literate women. States with a higher proportion of anaemic women in the 15-19 year age group have a low female literacy levels and very less females aged 6 years and older who have ever attended school. In states with a higher literacy rate among women, the prevalence of anaemia among women aged 15–19 years is lower. The negative correlation between literate women and women aged 20–24 who married before reaching the age of 18 suggests that states with a high level of female literacy have a low rate of child marriage. Similarly, the negative correlation between the female population aged 6 years and older who attended school and women aged 20–24 who married before reaching the age of 18; and between women with ten or more years of schooling and women aged 20–24 who married before reaching the age of 18 indicates that female literacy has a detrimental effect on child marriage. States such as Kerala, Goa, and Mizoram, which have extremely high rates of female literacy, report low rates of child marriage, whereas states such as Tripura and West Bengal, which have relatively high rates of female literacy, report high rates of child marriage. Additionally, there is a significant negative correlation between women with at least ten years of education and women aged 15–19 who were mothers or pregnant at the time of the survey. Increased schooling years have the effect of delaying marriage and pregnancy. As a result, the fertility rate decreases, as illustrated by the negative correlation between women with ten or more years of schooling and the adolescent fertility rate. States such as Bihar (28.8 percent) and Assam (29.6 percent), where very few women

have completed more than ten years of schooling, have extremely high rates of adolescent pregnancy and adolescent fertility. While states such as Kerala and Goa, where 77 percent and 71.5 percent of women, respectively, have completed at least ten years of education.

According to NFHS-5 data, there is a very weak correlation between anaemia and child marriage and teenage pregnancy among adolescent girls. However, further examination of the data reveals that women's literacy and education levels are significant predictors of adolescent women's health, nutrition, and wellbeing in India. The adolescent fertility rate is significantly inversely related to the percentage of literate women in the state, as well as the percentage of women with ten years or more of schooling. Additionally, there is a significant inverse relationship between women aged 15–19 who were already mothers or pregnant at the time of the survey (percent) and women with ten years of education. Thus, the existence of a significant negative correlation between anaemia in adolescent girls and the educational and literacy levels of women in the state, as well as between education and literacy levels of women and the prevalence of child marriage and teenage pregnancy, leads us to conclude that women's literacy and retention in school for longer years affects the health and wellbeing of adolescent girls in India.

Six states in India, Tripura, West Bengal, Jharkhand, Assam, Bihar, and Andhra Pradesh, have been identified as high-priority states for improving the health and wellbeing of adolescent girls. These states also require special attention for increasing girls' and women's literacy and education levels. Additionally, it demonstrates an upward trend in child marriages, teenage pregnancy, and adolescent fertility rates from NFHS-4 to NFHS-

5. Assam, Tripura, and West Bengal all rank higher than the national average in terms of women's literacy and women aged six years and above who have ever attended school, but these states rank significantly lower in terms of women completing ten years or more in school, implying that retention of girls in school for longer periods is a determinant of adolescent health and wellbeing in India. Jharkhand, Bihar, and Andhra Pradesh, the remaining three high-priority states, all score lower than the national average on selected indicators of adolescent girls' health and wellbeing, as well as women's literacy and educational attainment. Thus, these six states emerge as epicenters of the country's poor performance in terms of adolescent girls' health, nutrition, and well-being.

5. Discussion: Impact of policy governing issues of Adolescent health: Analysis of emerging patterns and lacunae

The central but unresolved question in health policy is whether public spending on health improves health outcomes. Numerous studies using a variety of methodologies demonstrate that health interventions can result in improved health outcomes, but it is extremely difficult to determine conclusively whether the improvement was caused by the intervention. To examine this connection, this section delves into the financial implementation of RKSK—the budget allocated and spending done at the state level, and the impact on adolescent girls' health outcomes (Ministry of Health and Family Welfare, 2020).

The budget gap under RKSK has been calculated by subtracting the expenditure/Utilization from State Programme Implementation Plan Approvals for the FY 2016-17, 2017-18 and 2018-19.

$$\text{Budget Gap} = \text{SPIP Approval} - \text{Expediture/Utilisation}$$

India is a union of states, with state governments funding health services at a higher rate than the central government (Farahani et al., 2010). The rapid programme review of RKSK was previously conducted by WHO at the request of the Government of India in four states (Haryana, Maharashtra, M.P., and Uttarakhand) and revealed that RKSK had taken a few lessons from the ARSH in terms of appointing dedicated human resources at the state, district, and block levels and establishing adolescent-friendly health clinics up to primary health centre level. There was an increase in funding for community-level activities, which increased community engagement (Barua et al., 2020).
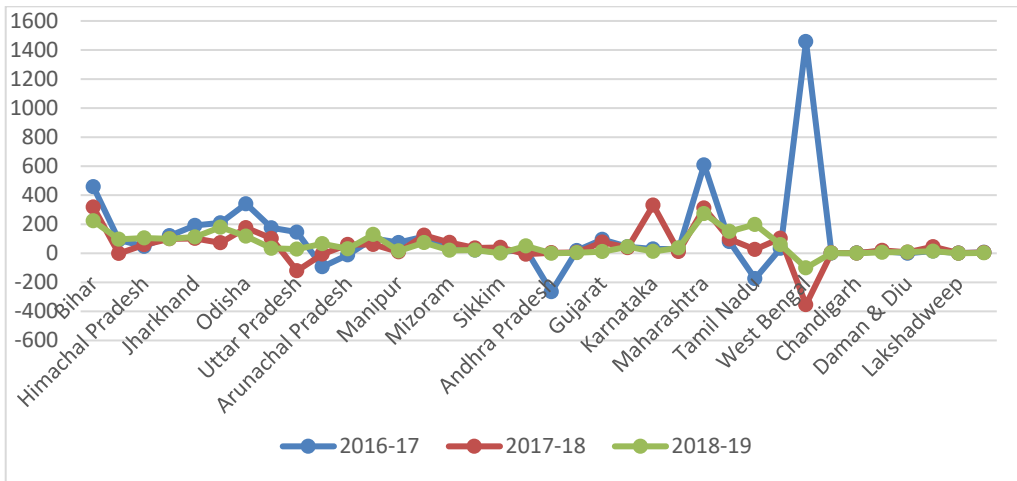
Figure 5: RKSK Budget Gap

The high-focus states under RKSK, such as Rajasthan, Odisha, Chattisgarh, and Jammu and Kashmir, have seen an increase of more than 10% in the prevalence of anaemia among adolescent girls, even though these are also the states with the largest unutilized funds under RKSK. Under the high focus category, the fact that UP and Uttarakhand performed positively in terms of anaemia reduction, albeit marginally, is entirely consistent with their RKSK spending patterns. They have overspent in some fiscal years, and the gap between allocation and expenditure is also relatively small. In the State of Uttar Pradesh, fund release has been made more flexible beginning in FY 2018-19, with one-fourth of the allocated sum released as a lump sum amount at the start of each quarter, rather than under a specific budget head. (Centre for Policy Research, 2020).

Sikkim has marginally reduced anaemia in the north-eastern states, which is consistent with its spending pattern under RKSK. Tripura, which has a small budgetary gap between allocated and spent funds, is an outlier due to its persistently high anaemia rate. The prevalence of anaemia among adolescent females has increased by 15%. This is a grave situation, given the previous section's finding that child marriage, teenage pregnancy, and adolescent fertility rates will all increase in the coming years. This further jeopardizes the health and nutritional status of adolescent females.

The non-high focus states of Haryana, Kerala, and Tamil Nadu, which have spent significantly less than RKSK, have seen a decline in anaemia incidence. While West Bengal had a large budget surplus in FY 2016-17, the state's spending deficits in FY 2017-18 and 2018-19 resulted in an 8% increase in anaemia. Small states and union territories such as Andaman and Nicobar, Delhi, Chandigarh, Dadra and Nagar Haveli, and Lakshadweep have demonstrated a positive trend in reducing anaemia. Their budget and expenditure gaps are quite small. As a result of these findings, it can be concluded that states that spend more on the health of adolescents under RKSK have done a better job of reducing the prevalence of anaemia among adolescent girls. While states with a large budget surplus or an unutilized portion of the RKSK have done well in controlling anaemia, those with a small budget surplus or an unutilized portion have done poorly.

6. Conclusions

Improving adolescents' nutrition behaviours is an investment in adult health. It is going to yield triple dividends- better health for adolescents now, improved well-being and productivity in their future adult life and reduced health risks for their children. (World Health Organization, 2018) At this stage, there is still the possibility of correcting nutritional deficiencies and possibly even catching up on growth. Nutrition intervention in adolescent females may help break the cycle of intergenerational malnutrition, poverty, and chronic disease.

Adolescent girls' health and nutritional status in general, and the prevalence of anaemia in particular, are influenced by factors such as vegetarianism, underweight, obesity, deworming, and the presence of pallor. (Kamble et al., 2021). Socioeconomic status, education, worm infestation, menstruation, and pregnancy have all been found to be associated with anaemia in adolescent females. (Siva et al., 2016).

The urgency to focus on anemia amongst adolescent girls is driven by the NFHS-5 report indicating escalation of anemia at pan India level the year 2015-16 to the year 2019-20. States such as Chattisgarh, Odisha, Rajasthan, Assam, Mizoram, Tripura, Goa, and Gujarat and Union territories of Jammu and Kashmir and Ladakh have seen a steep increase in the incidence of anemia among adolescent girls Increasing anemia is a worrisome situation which cannot be addressed without taking cognizance of the socio-economic and cultural connotation. The prevalence of anaemia is determined by women's literacy levels. States such as Kerala, Manipur, Mizoram- where literacy level amongst women is high and where the number of females above 6 years who have ever attended school is also high, have lower prevalence of anaemia than states (Bihar, Madhya Pradesh, Rajasthan, Telangana, Uttar Pradesh) with low literacy rate amongst women have higher prevalence of anaemia. This study of data from all states confirmed once again that there is a negative correlation between a woman's educational status and the prevalence of anaemia in that state (Das et al., 2022).

Similarly, the incidence of underage marriage, adolescent pregnancy, and fertility is determined by the literacy level and number of years of schooling of females. Except for Tripura and West Bengal, states with a high prevalence of underage marriage, adolescent pregnancy and fertility were those with a high prevalence of anaemia (Bihar, Assam). Thus, anemia can be prevented by avoiding certain modifiable risk factors such as low education, a lack of iron-rich foods, and a diet lacking in variety (Ghosh et al., 2020). It was also found that the longer a woman spends her time in schooling, less is the likelihood of adolescent pregnancy. Poor performing states-Tripura, West Bengal, Andhra Pradesh Bihar in terms of adolescent pregnancy (high), women with 10 or more years of schooling (low) report higher incidence of anemia.

This study supports the hypothesis that increased public expenditure on health, results in improved health outcomes. The States (Uttar Pradesh, Uttarakhand, Haryana, and Kerala) that spent more under RKSK fared better in terms of controlling anaemia among adolescent girls, whereas the States (Bihar, Odisha, Rajasthan, Maharashtra, and others) with large budget surpluses or unutilized funds fared poorly. States such as Tripura and West Bengal, which have spent sparingly, continue to be the worst performers in terms of anaemia control, most likely due to their socioeconomic status (high incidence of underage

marriage, adolescent pregnancy and fertility rate and low income). Budget allocation under different policy directive of the state won't be efficacious and will fail to achieve the desired outcomes unless utilized judiciously and with correct planning and implementation.

This study supports the idea that health status of a group cannot be divorced from their socio-economic/cultural status. Any intervention to improve healthcare of the adolescent girls needs to be holistic in approach therefore to combat the high prevalence of anaemia among adolescent females, a multi-pronged approach is required. On the one hand, literacy and educational standards must be raised. It must be ensured that girls receive ten or more years of education to delay marriage and pregnancy. Additionally, enrolling in school or another formal or informal institution (mainstreaming) enables them to benefit from periodic anaemia screening and weekly iron and folic acid supplementation (WIFS) to increase iron intake, as well as nutritious mid-day meals, which promotes dietary diversification. (Mehrotra et al., 2018). Additionally, T3 camps should be held at regular intervals in all schools to address the issue of adolescent anaemia (Kamble et al., 2021). Regular testing is necessary to detect and treat pregnant women who are anaemic, which will accelerate the rate of anaemia reduction (Kalaivani K. et al., 2018).

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