Early childhood circumstances and educational wellbeing inequality among tribal and non-tribal children in India: evidence from a panel study

Rashmi Rashmi1 & Ronak Paul2*

Despite efforts towards bridging the education gap between tribal (Scheduled Tribe) and non-tribal (Non-Scheduled Tribe) children, contrasting poor-quality education questioned the tribal children’s educational wellbeing in India. Early childhood circumstances render a remarkable impact on the educational wellbeing of children in later years. This study examined the influence of early childhood circumstances (child, household and community characteristics) during 2005 on the educational wellbeing inequality among India’s tribal and non-tribal children during 2012 using the India Human Development Survey panel dataset of 8611 children. The Educational wellbeing score was obtained from reading, mathematical and writing test scores using Principal Component Factor Analysis. We performed the Blinder-Oaxaca decomposition of the educational wellbeing inequality among India’s tribal and non-tribal children. The ST children’s average educational wellbeing score (−0.41) was much lower than the Non-ST children (0.04). Findings from the Blinder-Oaxaca decomposition show that the household economic condition in children’s early ages contributed to 24% of educational wellbeing inequality among tribal and non-tribal children. Further, the education status of males and female adults and the sanitation condition of families considerably impacted educational wellbeing. The present study concludes that caste antagonism has not reduced with time. The missing focus on the minority groups resulted in a deteriorated educational wellbeing.

Indian society is a glorious heritage of varied cultures, languages and social identities. Such rich diversity has provided many blessings but, at the same time, brought significant challenges from the past. The insurance of providing equal educational opportunities is one such difficulty which government of India had to face while uplifting the lives of every individual1. Notably, in the case of the Scheduled Tribes population, imparting education was a serious concern due to cultural and geographical isolation2. Historically, Scheduled Tribes were termed as ‘depressed classes’, and ‘backward classes’ and mainly were isolated from the rest of the Indian society due to embedded caste and social hierarchies3. Such terms were further replaced, and the government renamed these communities as tribals who were protected and aided with particular interventions, starting with the enforcement of Article 342 of the Constitution of India. Traditionally, these tribal groups reside in remote areas, close to nature4. Unfortunately, the fast-moving modernization from cities to outskirts has resulted in a massive encroachment, resulting in displacement and leaving them exploited and poor5.

Education was the secondary issue for the Scheduled Tribes population as they usually struggled to fulfil their basic livelihoods needs due to continuous economic exploitation by non-tribals5. However, understanding the importance of education in uplifting lives and capital formation, the government of India started different initiatives like ashram schools or residential schools exclusively for ST children to educate and integrate them into mainstream society6. In the 1970s, the concept of ashram schools was initiated to overcome the structural barriers of tribal children in acquiring elementary to higher schooling education. Unfortunately, the poor quality of education and exclusion of the history and socio-cultural lives of Scheduled tribes' communities in the curriculum demoralize the families to send their children6. Moreover, their dropout rates were very high among

1Department of Population and Development, International Institute for Population Sciences, Mumbai 400088, India. 2Department of Public Health and Mortality Studies, International Institute for Population Sciences, Mumbai 400088, India. *email: ronakpaulpc@yahoo.com
those who went to ashram schools. So, despite the continuous government efforts, the gap between tribal and non-tribal populations did not narrow down in these years due to discrimination, brutal suppression, and economic exploitation7. As a result, today, Scheduled Tribes constitute 9% of the total population, with literacy rates of merely 59% in 2011, which is much below India’s total literacy rate of 74%

One study from the tribal district of Dang in the Gujarat state of India shows that common toilet facilities for girls and boys were the standard issue for preventing the tribal girls from re-enrolling after primary schooling (beyond the fifth standard)3. Moreover, higher dropout was observed among schools if the instruction medium differed from the vernacular dialect of tribal children4. Another study from the Eastern Indian states of Jharkhand and West Bengal found that the dropout rates were high in tribal children due to economic hardship, especially during the cultivation period when the children helped their families with sowing and weeding plantation and harvesting activities10. In 2003, one study exploring multiple issues of primary education of tribal children of West Bengal concluded that poor infrastructure, shortage of schools and teachers, financial constraints in families, the rising market of private tuition had restricted the growth of tribal children11.

Though recent years have seen little success in bringing ST children to schools, the availability of such poor-quality education and problems with accessibility has constantly questioned their educational wellbeing. A cross-sectional study from India Human Development Survey 2005 shows that the Brahmin and high caste children enjoyed a higher competence in reading, writing and mathematical skills than their Dalit and tribal counterparts8. Besides the various factors mentioned in past research evidence, early life circumstances can also play a detrimental role in an individual’s development, especially for the ST population, deprived and marginalized in Indian society. Ample evidence shows that experience of conflicts, parent’s socioeconomic status, parental education, household condition and health condition in childhood have a persistent effect on the individual’s education13-27. Studies have shown that growing up with a low socioeconomic background is highly associated with lower achievements and job discontinuation in adulthood18. Being dependent on forests and natural resources can exert constant wealth shocks on the tribal population leading to absenteeism, dropout, stagnation that can further affect their educational wellbeing.

Using a panel dataset, this study examines to what extent early life circumstances (child, parents and household characteristics at 1–4 years of age) lead to a differential in educational wellbeing among tribal and non-tribal children (aged 8–11 years) in India. The rationale of such analysis is as follows. First, although the enrolments have increased in the last decade, difficulties in acquiring education among India’s tribal population persist. While education has helped eradicate the caste and hierarchy system in India, there reside few tribal populations which are isolated culturally and geographically, limiting the government to achieve the goal of universal elementary education in India. Moreover, the tribal children moving to schools for better opportunities are often restricted due to discrimination and exploitation. Second, while the government initiatives had increased the reach of children to schools, a prominent factor like quality education is often questioned in the form of deteriorated educational wellbeing rates among tribal children. Past evidence provided a clear picture of the poor schooling quality of tribal children. It forced us to think about the factors responsible for the educational wellbeing inequality among tribal and non-tribal children. Third, along with the inequality due to caste, one of the significant determinants, i.e., early life experiences of tribal children, must be considered due to their vulnerable and marginalized place of origin. Most brain development occurs during early childhood and experiencing toxic stress during this period hampers educational wellbeing in later years36-38. Therefore, using a panel dataset, the present study explores the long-term educational implications of the early childhood circumstances among India’s tribal and non-tribal children. Our primary objective is to determine the long-term contribution of early childhood covariates to the inequality in educational wellbeing attainment among tribal and non-tribal children in India.

Methods
Data. The India Human Development Survey (IHDS) rounds -I and -II were used in this study. The 2005 IHDS round-I was a nationally representative multi-topic survey of 215,754 people from 41,554 households21. Round-II, conducted in 2012, was a multi-topic panel survey of 204,569 people from 42,152 households in India22. The University of Maryland, USA and the National Council of Applied Economics Research (NCAER), India, conducted the two IHDS rounds in India’s states and union territories (except Andaman and Nicobar Islands and Lakshadweep). Round-II of the IHDS re-interviewed 83% of the original families from round-I living in the same village. IHDS used a stratified random sampling design to choose samples. More information on the sampling design, survey timeframe, and data collection methods used in rounds I and II can be found elsewhere35,25. The analytical sample is the panel of 8611 children aged 1–4 years in round-I who became 8–11 years old during round-II, after excluding the missing observations (see Fig. 1). Of the 8,611 children, 7850 (91%) and 761 (9%) belonged to the Non-ST and ST caste groups.

Constructing the educational wellbeing index. The continuous indicator of educational wellbeing during round-II is the outcome variable of this study. The mathematical, reading and writing test scores of children aged 8–11 years were used to prepare the educational wellbeing score.

The reading skill of students has five categories:

(1) cannot read at all (score 0),
(2) can read alphabets but not words (score 1),
(3) can read words but cannot read entire sentences (score 2),
(4) can read a short paragraph but cannot read a whole page (score 3),
(5) can read a complete story (score 4).

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Equivalently, the mathematical skill of students has four categories –

1. cannot read numbers (score 0),
2. can recognize numbers but cannot do any arithmetic operations (score 1),
3. can subtract a two-digit number from another number (score 2),
4. can divide a three-digit number by a one-digit number (score 3).

The writing skill of students is categorized:

1. cannot write at all (score 0),
2. can write a sentence with two or fewer mistakes (score 1),
3. can write with no mistakes (score 2).

The educational wellbeing variable was constructed using Principal Component Factor Analysis (PCFA) on the reading, mathematical, and writing skill variables and the detailed procedure is described elsewhere²⁵. Notably, the PCFA for educational wellbeing indicators resulted in a one-factor solution. From supplementary Table S1, we observed that the first factor had an eigenvalue of more than one and explained 73.4% of the total variability of all three educational wellbeing indicators. All three indicators had factor loading values of more than 0.80. Further, all indicators had Kaiser-Meier-Olkin (KMO) values greater than 0.70, thereby justifying our use of PCFA (KMO values greater than 0.50 are necessary for conducting PCFA). Finally, we generated the standardized educational wellbeing score based on the first factor.

**Group variable.** The binary caste group variable, whether an individual belongs to the Scheduled Tribes (ST) or Non-ST, is the group variable. The caste system is a form of social hierarchy native to India. Notably, the Indian constitution recognizes three distinct social groups—Scheduled Tribes, Scheduled Castes and Other Backward Classes. People in the ST (predominantly tribal population) and SC categories are the most socially backward. They traditionally belonged to the lowest rung of India’s now-defunct caste system. People of the OBC category, as the name implies, are also members of a socially and economically backward community. However, their circumstances are better than those of the SC/ST population. The “Others” category consists of all people
who do not belong to the three caste groups. During round-II, IHDS classified the caste of the household head into five categories—Brahmin, Other Backward Classes (OBC), Scheduled Castes (SC), Schedule Tribes (ST), Others. In this study, we re-coded the original variable into ST and Non-ST groups because the ST children’s educational wellbeing is markedly lower than the Non-ST children during round-II (see Figs. 2 and 3).

**Explanatory variables.** Taking a cue from extant research, we included the child-, household- and community-related independent variables which explained educational wellbeing in Indian children. All the variables were obtained for children aged 1–4 years in round-I unless mentioned otherwise. The child-related explanatory characteristics are:

1. Age of children in years (One, Two, Three, Four).
2. Gender of the children (Female, Male).
3. Stunting status of children (Stunted, Not stunted). Stunting indicates chronic undernutrition in children and is denoted by low height-for-age z-scores (HAZ). Although IHDS does not provide ready-made HAZ scores, we obtained the HAZ scores of children aged 1–4 years in 2005 from their anthropometric data and the WHO Anthro software. Children with HAZ scores of less than –2 standard deviations (SD) and more than –6SD were coded as “Stunted”, and those having HAZ scores of more than –2SD and less than +6SD were coded as “Not stunted”.
4. Type of school attended in round-II (Public school, Private school).
5. Takes private tuition in round-II (No, Yes).

The household-related explanatory characteristics are:

6. Place of cooking in the household (Not in living area, In living area).
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(7) Type of cooking fuel (Solid fuel, Clean fuel).
(8) Household sanitation condition (Poor, Average, Good). Based on extant studies, the sanitation condition of the household was prepared from the information on the type of drinking water, type of toilet facility and the number of members per room during 2005. Households having “improved” drinking water and toilet facilities were scored as “1”, and households in the “unimproved” counterpart were scored as “0”. Equivalently, households with less than three members per room were scored as “1” and “0” otherwise. We added scores of the three variables to obtain household sanitation scores ranging from 0 to 3. Households with a score of 3, 2, or less than 2 were classified as “good,” “average,” or “poor” sanitation households, respectively.
(9) Water purification in the household (No, Yes).
(10) Household wealth quintile (Poorest, Poor, Medium, Rich, Richest). The household wealth quintile variable was constructed using standard procedures documented elsewhere. We generated wealth scores by applying principal component factor analysis (PCFA) on the household asset ownership, livestock ownership, and type of building material information during 2005. The households were then classified into five wealth quintiles from “poorest” to “richest” based on the wealth scores.
(11) Household poverty status (Below poverty line, Not below poverty line).
(12) Highest educational level of male adults in household (No formal schooling, Upto 5 years of schooling, 6–10 years of schooling, More than 10 years of schooling). IHDS 2005 provided information for years of schooling for each adult (aged 21 years and above), aggregated to obtain the highest year of schooling among all male adults in a household. Based on general milestones in the Indian education system, we further recategorized the information on years into four classifications.
(13) Highest educational level of female adults in household (No formal schooling, Upto 5 years of schooling, 6–10 years of schooling, More than 10 years of schooling). The construction of this variable is similar to the highest educational level of male adults in the household.
(14) Gender of household head (Male, Female).
(15) Religion of household head (Hindu, Muslim, Others).
(16) Types of mass media viewed by children (None, One, Two or more).
(17) Women’s autonomy in child healthcare in the household (No, Yes).
(18) Attack/threat on household (Yes, No).

The community-related explanatory characteristics are:
(19) Solving community problems (Each family individually, All families together).
(20) Domestic violence in the community (Yes, No). IHDS 2005, collected information from a single woman (aged 15–49 years) from each household on whether husbands in the community assaulted their wives if—”her natal family does not provide money, jewelry and other items”, “she does not cook food properly”, “she goes out without telling him”, “she neglects the house or the children” and “is suspected of having a relationship with other men”. If a woman responded positively to any of the five questions, we classified domestic violence status in the community as “Yes” or a “No” otherwise.
(21) Type of community (Urban, Rural).
(22) Country regions (Northern, North-eastern, Central, Eastern, Western, Southern). We divided India’s erstwhile 33 states and union territories into six regions based on administrative classification and geographical location.

Statistical methods. At the start, we showed the absolute and percentage distribution of children by the background characteristics in round-I. The caste difference in average educational wellbeing score was assessed using the two-sample t-test. The caste difference in educational wellbeing across the explanatory variables was assessed using the chi-square test for independence. Next, we estimated multivariable linear regression models to examine the association between child-, household- and community-related variables in 2005 with the educational wellbeing of children in 2012. The coefficient in the multivariable models gives the adjusted change in the educational wellbeing score in round-II of children belonging to a particular category of an explanatory variable in round-I after adjusting for the effect of all the other explanatory variables. The above analyses were performed separately for ST and Non-ST children.

Further, we used the Blinder-Oaxaca twofold decomposition technique to identify the contribution of explanatory covariates in 2005 behind the caste differential in the educational wellbeing of children in 2012. We show the overall and detailed decomposition of the caste differential in educational wellbeing. In the overall decomposition, the caste gap in educational wellbeing is decomposed into an explained (E) component and an unexplained (C) component. The detailed decomposition shows the relative contribution of each child-, household- and community-related early childhood characteristics to caste inequality in educational wellbeing during 2012.

Note that the Non-ST group is heterogeneous (as it comprises SC, OBC and Others groups), and the results of the decomposition estimates might vary if we compare the ST children’s educational wellbeing with that of SC, OBC and Others children individually. Therefore, we decomposed the educational wellbeing gap between ST and SC children, ST and OBC children, and ST and Others children, respectively. We performed this sensitivity analysis to check the sensitivity of the decomposition estimates (shown in Table 4) to the categorization of comparison groups. In our tests, none of the multivariable models violated the assumption of multicollinearity. STATA software version 14 was utilized for all statistical estimations.
region [β: 0.28, CI: (0.02, 0.53)]. The educational wellbeing score of ST children was higher in Western regions of India than in the Northern
contain domestic violence [β: 0.09, CI: (0.04, 0.14)] had better educational wellbeing than their counterparts.

Children from communities where people solved their problems together [β: 0.05, CI: (0.02, 0.09)] and did not
educational wellbeing among both ST [β: 0.28, CI: (−0.03, 0.58)] and Non-ST [β: 0.32, CI: (0.25, 0.39)] children.
The household. Further, having a female adult with more than 10 years of schooling in a household increases
private tuition. The educational wellbeing score of children increases with the increasing economic gradient of
age) decreased children's educational wellbeing scores. In 8–11 years, taking private tuition was associated with
increased among ST and Non-ST children with the growing age. Being stunted at an early age (1–4 years of
being [coefficient (β): 0.14, 95% CI: (0.07, 0.21)] than their ST counterparts. Child educational wellbeing scores
shows that children from the Non-ST group had a significantly higher likelihood of attaining educational well-
ing of children in 2012 and their individual, household and community characteristics during 2005. The result
Evaded that would lead to the identification of the respondents. IHDS obtained the consent of respondents before data
collection. Therefore, no ethical approval was necessary. All survey methods were performed following the rel-
Evaded. Only the percentage distribution of children by age and type of community differed by greater than 3% between the two surveys.

Multivariable analysis. Table 2 represents the multivariable association between the educational wellbeing of children in 2012 and their individual, household and community characteristics during 2005. The result shows that children from the Non-ST group had a significantly higher likelihood of attaining educational wellbeing [coefficient (β): 0.14, 95% CI: (0.07, 0.21)] than their ST counterparts. Child educational wellbeing scores increased among ST and Non-ST children with the growing age. Being stunted at an early age (1–4 years of age) decreased children's educational wellbeing scores. In 8–11 years, taking private tuition was associated with a significantly higher educational wellbeing score [β: 0.20, CI: (0.15, 0.25)] than children who did not take private tuition. The educational wellbeing score of children increases with the increasing economic gradient of the household. Further, having a female adult with more than 10 years of schooling in a household increases educational wellbeing among both ST [β: 0.28, CI: (−0.03, 0.58)] and Non-ST [β: 0.32, CI: (0.25, 0.39)] children. Children from communities where people solved their problems together [β: 0.05, CI: (0.02, 0.09)] and did not contain domestic violence [β: 0.09, CI: (0.04, 0.14)] had better educational wellbeing than their counterparts. The educational wellbeing score of ST children was higher in Western regions of India than in the Northern region [β: 0.28, CI: (0.02, 0.53)].

Decomposing the caste inequality in educational wellbeing score. Table 3 reveals the overall Blinder-Oaxaca decomposition of educational wellbeing scores among India’s ST and Non-ST children. While adjusting endowment levels of Non-ST children with that of their ST counterparts would increase the ST children’s educational wellbeing score by 79.1%, 20.9% of differences were left unexplained. Further, we presented a detailed decomposition analysis of the inequality in educational wellbeing scores among India’s ST and Non-ST children (Table 4). Among 79.1% explained share, household-level variables of wealth quintile (24.3%), highest educational level of adult males (13.7%) and females (13.1%) in the families has a prominent contribution to ST and Non-ST children’s educational wellbeing inequality. Among the child-related characteristics, taking private tuitions (6.9%), school attending status (6.2%), and stunting status (2.5%) had significantly higher contributions to caste inequality. Additionally, household sanitation conditions and poverty status contribute to children’s educational wellbeing inequality. Domestic violence in the community (−0.8%) shows a significantly negative influence on the inequality of educational wellbeing scores. This negative value indicates that ST children experience higher educational wellbeing scores in a community with no domestic violence, and if we eliminate this advantage, it would further deteriorate their children’s educational wellbeing scores.

Sensitivity analysis of decomposition estimates to the categorization of comparison groups. Table 5 shows the decomposition of the educational wellbeing gap among children in ST and Non-ST, ST and SC, ST and OBC, and ST and Others groups, respectively. We find that the direction of contribution is the same across all the statistically significant contributors in the four decomposition estimates. The explained educational wellbeing difference between ST and Non-ST groups is similar for the ST and OBC, and ST and Others groups. The magnitude of the percentage contribution of each statistically significant contributor varies across the four decomposition estimates. However, the difference in the percentage contribution is not more than 5% in the contributors across the four decomposition estimates.

Ethics declarations. The present study utilized a publicly available secondary dataset with no information that would lead to the identification of the respondents. IHDS obtained the consent of respondents before data collection. Therefore, no ethical approval was necessary. All survey methods were performed following the relevant guidelines and regulations.
| Characteristics                          | Panel of children aged 1-4 in round-I |
|-----------------------------------------|---------------------------------------|
|                                         | All children | ST group | Non-ST group | Caste difference |
|                                         | Mean/N SD/% | Mean/N SD/% | Mean/N SD/% | p-value          |
| Educational wellbeing score            | 0.00 1.00   | 0.41 0.98  | 0.04 0.01   | < 0.001          |
| Caste of household head                |             |          |              |                 |
| ST group                               | 761 8.8     | 127 16.7  | 1369 17.4    | (0.674)          |
| Non-ST group                           | 7850 91.2   | 1369 17.4 | 1651 21.0    |                 |
| Age of children (in years)             |             |          |              |                 |
| One                                    | 1496 17.4   | 127 16.7  | 1651 21.0    |                 |
| Two                                    | 2474 28.7   | 232 30.5  | 1623 20.7    |                 |
| Three                                   | 2671 31.0   | 236 31.0  | 1623 20.7    |                 |
| Four                                    | 1970 22.9   | 166 21.8  | 1804 23.0    |                 |
| Gender of the children                 |             |          |              |                 |
| Female                                 | 4082 47.4   | 357 46.9  | 3725 47.5    | 0.776            |
| Male                                   | 4529 52.6   | 404 53.1  | 4125 52.5    |                 |
| Stunting status of children            |             |          |              |                 |
| Stunted                                | 3975 46.2   | 404 53.1  | 3571 45.5    | < 0.001          |
| Not stunted                            | 4636 53.8   | 357 46.9  | 4279 54.5    |                 |
| Type of school attended in round-II    |             |          |              |                 |
| Public School                          | 5483 63.7   | 646 84.9  | 4837 61.6    | < 0.001          |
| Private School                         | 3128 36.3   | 115 15.1  | 3013 38.4    |                 |
| Takes private tuition in round-II      |             |          |              |                 |
| No                                     | 6616 76.8   | 684 89.9  | 5932 75.6    | < 0.001          |
| Yes                                    | 1995 23.2   | 77 10.1   | 1918 24.4    |                 |
| Place of cooking in household          |             |          |              |                 |
| Not in living area                     | 6732 78.2   | 473 62.2  | 6259 79.7    | < 0.001          |
| In living area                         | 1879 21.8   | 288 37.8  | 1591 20.3    |                 |
| Type of cooking fuel                   |             |          |              |                 |
| Solid fuel                             | 7432 86.3   | 725 95.3  | 6707 85.4    | < 0.001          |
| Clean fuel                             | 1179 13.7   | 36 4.7    | 1143 14.6    |                 |
| Household sanitation condition         |             |          |              |                 |
| Poor                                   | 4550 52.8   | 543 71.4  | 4007 51.0    | < 0.001          |
| Average                                | 2890 33.6   | 190 25.0  | 2700 34.4    |                 |
| Good                                   | 1171 13.6   | 28 3.7    | 1143 14.6    |                 |
| Water purification in household        |             |          |              |                 |
| No                                     | 6133 71.2   | 536 70.4  | 5597 71.3    | 0.614            |
| Yes                                    | 2478 28.8   | 225 29.6  | 2253 28.7    |                 |
| Household wealth quintile              |             |          |              |                 |
| Poorest                                | 1884 21.9   | 408 53.6  | 1476 18.8    | < 0.001          |
| Poor                                   | 1694 19.7   | 179 23.5  | 1515 19.3    |                 |
| Medium                                 | 1719 20.0   | 89 11.7   | 1630 20.8    |                 |
| Rich                                   | 1759 20.4   | 46 6.0    | 1713 21.8    |                 |
| Richest                                | 1555 18.1   | 39 5.1    | 1516 19.3    |                 |
| Household poverty status               |             |          |              |                 |
| Below poverty line                     | 2782 32.3   | 456 59.9  | 2326 29.6    | < 0.001          |
| Not below poverty line                 | 5829 67.7   | 305 40.1  | 5524 70.4    |                 |
| Highest educational level of male adults in household |         |          |              |                 |
| No formal schooling                    | 1989 23.1   | 299 39.3  | 1690 21.5    | < 0.001          |
| Upto 5 years of schooling              | 1343 15.6   | 155 20.4  | 1188 15.1    |                 |
| 6-10 years of schooling                | 2307 26.8   | 164 21.6  | 2143 27.3    |                 |
| More than 10 years of schooling        | 2972 34.5   | 143 18.8  | 2829 36.0    |                 |
| Highest educational level of female adults in household |      |          |              |                 |
| No formal schooling                    | 3893 45.2   | 478 62.8  | 3415 43.5    | < 0.001          |
| Upto 5 years of schooling              | 1273 14.8   | 112 14.7  | 1161 14.8    |                 |
| 6-10 years of schooling                | 1727 20.1   | 104 13.7  | 1623 20.7    |                 |
| More than 10 years of schooling        | 1718 20.0   | 67 8.8    | 1651 21.0    |                 |
| Gender of household head               |             |          |              |                 |
| Continued                              |             |          |              |                 |
Discussion

Understanding the power of education in changing the lives of individuals, families and communities, the government of India has made a constant effort to bring children to schools and provide primary education. However, before celebrating the success of bridging the schooling gap in tribal (ST) and non-tribal (Non-ST) children, it is essential to determine the quality of education these children received in the past few years. Sadly, the present study shows a challenging face of the education system, where the educational wellbeing score of tribal children is significantly lower than their non-tribal counterparts. The salient findings of the study and their explanations are as follows:

First, although the government has tried to eradicate caste-based discrimination in the education system, it is still prevalent with the tribal population at the receiving end. This finding is supported by the multivariable regression and decomposition analysis results. Such a situation may arise due to the unavailability of good schools in the community and qualified teachers. Past evidence has shown that their reading, writing, and mathematical competence was shallow even if the tribal children were attending schools. Curriculum and communication play an essential role in preventing children's educational wellbeing. It has been observed that the inclusion of local culture, folklore and history, and the local dialect in the curriculum builds confidence in tribal children. Further, interpreting through paintings, music, and storytelling can improve their educational wellbeing as they are common in their culture.

Table 1. Socio-demographic, health-related, household and community characteristics profile of the panel of children aged 1–4 years during IHDS round-I. (a) N sample size, SD standard deviation, %: column percentage; (b) difference in educational wellbeing score by caste group was tested using T-test while the caste difference of explanatory variables was tested using the chi-square test for independence.
| Characteristics                          | All children | ST group | Coef | 95% CI | Non-ST group | Coef | 95% CI |
|-----------------------------------------|--------------|----------|------|--------|--------------|------|--------|
| **Characteristics**                     |              |          |      |        |              |      |        |
| Caste of household head                 |              |          |      |        |              |      |        |
| ST group                                | (Ref)        |          |      |        |              |      |        |
| Non-ST group                            | 0.14***      | (0.07, 0.21) |      |        |              |      |        |
| Age of children (in years)              |              |          |      |        |              |      |        |
| One (Ref)                               | (Ref)        |          |      |        |              |      |        |
| Two                                     | 0.21***      | (0.16, 0.27) |      |        | 0.21***      | (0.15, 0.27) |      |        |
| Three                                   | 0.37***      | (0.32, 0.43) |      |        | 0.37***      | (0.31, 0.43) |      |        |
| Four                                    | 0.49***      | (0.43, 0.55) |      |        | 0.48***      | (0.42, 0.54) |      |        |
| Gender of the children                  |              |          |      |        |              |      |        |
| Female (Ref)                            | (Ref)        |          |      |        |              |      |        |
| Male                                    | 0.01         | (− 0.03, 0.05) |      |        | 0.0051       | (− 0.04, 0.04) |      |        |
| Stunting status of children             |              |          |      |        |              |      |        |
| Stunted (Ref)                           | (Ref)        |          |      |        |              |      |        |
| Not stunted                             | 0.15***      | (0.11, 0.19) |      |        | 0.15***      | (0.11, 0.19) |      |        |
| Type of school attended in round-II     |              |          |      |        |              |      |        |
| Government School                      | (Ref)        |          |      |        | (Ref)        |      |        |
| Private School                          | 0.15***      | (0.11, 0.20) |      |        | 0.15***      | (0.10, 0.20) |      |        |
| Takes private tuition in round-II       |              |          |      |        |              |      |        |
| No (Ref)                                | (Ref)        |          |      |        | (Ref)        |      |        |
| Yes                                     | 0.20***      | (0.15, 0.25) |      |        | 0.20***      | (0.15, 0.25) |      |        |
| Place of cooking in household           |              |          |      |        |              |      |        |
| Not in living area                      | (Ref)        |          |      |        | (Ref)        |      |        |
| In living area                          | − 0.01       | (− 0.06, 0.04) |      |        | − 0.0053     | (− 0.06, 0.04) |      |        |
| Type of cooking fuel                    |              |          |      |        |              |      |        |
| Solid fuel                              | (Ref)        |          |      |        | (Ref)        |      |        |
| Clean fuel                              | − 0.01       | (− 0.08, 0.07) |      |        | − 0.0041     | (− 0.08, 0.07) |      |        |
| Household sanitation condition          |              |          |      |        |              |      |        |
| Poor (Ref)                              | (Ref)        |          |      |        | (Ref)        |      |        |
| Average                                 | 0.079***     | (0.04, 0.12) |      |        | 0.074***     | (0.03, 0.12) |      |        |
| Good                                    | 0.19***      | (0.12, 0.26) |      |        | 0.18***      | (0.11, 0.26) |      |        |
| Water purification in household         |              |          |      |        |              |      |        |
| No (Ref)                                | (Ref)        |          |      |        | (Ref)        |      |        |
| Yes                                     | 0.057**      | (0.01, 0.10) |      |        | 0.069***     | (0.02, 0.12) |      |        |
| Household wealth quintile               |              |          |      |        |              |      |        |
| Poorest (Ref)                           | (Ref)        |          |      |        | (Ref)        |      |        |
| Poor                                    | 0.13***      | (0.07, 0.19) |      |        | 0.12***      | (0.06, 0.19) |      |        |
| Medium                                  | 0.28***      | (0.21, 0.34) |      |        | 0.28***      | (0.21, 0.35) |      |        |
| Rich                                    | 0.30***      | (0.22, 0.37) |      |        | 0.31***      | (0.23, 0.39) |      |        |
| Richest                                 | 0.38***      | (0.28, 0.47) |      |        | 0.39***      | (0.29, 0.49) |      |        |
| Household poverty status                |              |          |      |        |              |      |        |
| Below poverty line                      | (Ref)        |          |      |        | (Ref)        |      |        |
| Not below poverty line                  | 0.075***     | (0.03, 0.12) |      |        | 0.068***     | (0.02, 0.11) |      |        |
| Highest educational level of male adults in household | | | | | | | |
| No formal schooling                     | (Ref)        |          |      |        | (Ref)        |      |        |
| Upto 5 years of schooling               | 0.12***      | (0.06, 0.19) |      |        | 0.13***      | (0.07, 0.20) |      |        |
| 6–10 years of schooling                 | 0.20***      | (0.14, 0.26) |      |        | 0.21***      | (0.15, 0.27) |      |        |
| More than 10 years of schooling         | 0.28***      | (0.21, 0.34) |      |        | 0.28***      | (0.21, 0.34) |      |        |
| Highest educational level of female adults in household | | | | | | | |
| No formal schooling                     | (Ref)        |          |      |        | (Ref)        |      |        |
| Upto 5 years of schooling               | 0.22***      | (0.16, 0.28) |      |        | 0.21***      | (0.15, 0.27) |      |        |
| 6–10 years of schooling                 | 0.30***      | (0.25, 0.36) |      |        | 0.30***      | (0.24, 0.36) |      |        |
| More than 10 years of schooling         | 0.32***      | (0.25, 0.39) |      |        | 0.32***      | (0.25, 0.39) |      |        |
| Gender of household head                |              |          |      |        |              |      |        |
| Male (Ref)                              | (Ref)        |          |      |        | (Ref)        |      |        |
| Continued                               |              |          |      |        |              |      |        |
Second, early life stunting status can hinder the educational wellbeing of children. Consistent with the present study, an Indian study showed that child nutritional status affects their physical, cognitive and language development. Moreover, the present study confirms that the child’s educational wellbeing depends on their type of school and private tuition. Besides, these child characteristics—stunting status in early life, private schooling, and private tuitions largely contribute to the educational wellbeing inequality between tribal (ST) and non-tribal groups.

### Table 2. Linear regression models showing the multivariate association between educational wellbeing score and the individual, household and community characteristics of the panel of children aged 1–4 years during IHDS round-I.

| Characteristics                          | All children | ST group | Non-ST group |
|------------------------------------------|--------------|----------|--------------|
| Female                                   | 0.04 (−0.04, 0.11) | 0.0083 (−0.27, 0.28) | 0.036 (−0.05, 0.12) |
| Religion of household head               |              |          |              |
| Hindu                                     | (Ref)        | (Ref)    | (Ref)        |
| Muslim                                    | −0.25*** (−0.30, −0.19) | 0.0050 (−0.78, 0.79) | −0.25*** (−0.30, −0.19) |
| Others                                    | 0.05 (−0.03, 0.13) | −0.012 (−0.22, 0.20) | 0.059 (−0.03, 0.15) |
| Types of mass media viewed by children   |              |          |              |
| None                                      | (Ref)        | (Ref)    | (Ref)        |
| One                                       | 0.01 (−0.04, 0.05) | −0.13* (−0.28, 0.02) | 0.017 (−0.03, 0.06) |
| Two or more                               | 0.02 (−0.03, 0.07) | −0.054 (−0.25, 0.15) | 0.025 (−0.03, 0.08) |
| Women’s autonomy in child healthcare in household |  |          |              |
| No                                        | (Ref)        | (Ref)    | (Ref)        |
| Yes                                       | 0.054** (0.01, 0.10) | −0.019 (−0.18, 0.14) | 0.057*** (0.01, 0.10) |
| Attack/threat on household                |              |          |              |
| Yes                                       | (Ref)        | (Ref)    | (Ref)        |
| No                                        | 0.22*** (0.11, 0.34) | 0.14 (−0.28, 0.55) | 0.24*** (0.12, 0.36) |
| Solving community problem                 |              |          |              |
| Each family individually                  | (Ref)        | (Ref)    | (Ref)        |
| All families together                     | 0.054*** (0.02, 0.09) | 0.18*** (0.05, 0.32) | 0.040** (0.00, 0.08) |
| Domestic violence in community            |              |          |              |
| Yes                                       | (Ref)        | (Ref)    | (Ref)        |
| No                                        | 0.091*** (0.04, 0.14) | 0.044 (−0.13, 0.22) | 0.10*** (0.05, 0.16) |
| Type of community                         |              |          |              |
| Urban                                     | (Ref)        | (Ref)    | (Ref)        |
| Rural                                     | 0.02 (−0.04, 0.07) | −0.099 (−0.37, 0.17) | 0.028 (−0.03, 0.08) |
| Country regions                           |              |          |              |
| Northern                                  | (Ref)        | (Ref)    | (Ref)        |
| North Eastern                             | −0.13* (−0.26, 0.01) | 0.11 (−0.26, 0.48) | −0.19** (−0.35, −0.03) |
| Central                                   | 0.036 (−0.03, 0.10) | −0.18 (−0.41, 0.05) | 0.084** (0.01, 0.15) |
| Eastern                                   | 0.024 (−0.04, 0.09) | −0.12 (−0.38, 0.14) | 0.041 (−0.02, 0.10) |
| Western                                   | 0.0044 (−0.06, 0.07) | 0.28** (0.02, 0.53) | −0.035 (−0.10, 0.03) |
| Southern                                  | −0.057* (−0.12, 0.00) | 0.14 (−0.14, 0.42) | −0.073** (−0.13, −0.01) |
| Adjusted R-squared                        | 0.248        | 0.231    | 0.238        |
| Analytical sample size                    | 8,611        | 761      | 7,850        |

### Table 3. Overall Blinder-Oaxaca decomposition of the caste differential in educational wellbeing score of the panel of children during IHDS round-II.

| Component                          | Caste differential in educational wellbeing |
|------------------------------------|---------------------------------------------|
| Explanined difference (E)          | −0.360*** (−0.398, −0.321)                  |
| Unexplained difference (U)         | −0.095*** (−0.163, −0.027)                  |
| Total difference (T)               | −0.454*** (−0.528, −0.381)                  |

Second, early life stunting status can hinder the educational wellbeing of children. Consistent with the present study, an Indian study showed that child nutritional status affects their physical, cognitive and language development. Moreover, the present study confirms that the child's educational wellbeing depends on their type of school and private tuition. Besides, these child characteristics—stunting status in early life, private schooling, and private tuitions largely contribute to the educational wellbeing inequality between tribal (ST) and non-tribal.
holds which can pay. Most tribal households cannot fulfill their basic living needs, so education becomes their hindrances to children's educational wellbeing, as the spending on education can be done only in those households' (Non-ST) children. Third, early life circumstances like household wealth index and poverty status are significant asterisks where *p-value < 0.1, **p-value < 0.05 and ***p-value < 0.01.

The panel nature of this study helps us point out the role of individual, household and community factors during crop cultivation. This situation can leave the children behind in the classroom compared to other regularly attending schools. Fourth, parents’ education or the education of household members can also affect the educational wellbeing of children. Since uneducated elders in the household cannot help the children efficiently, studies have shown that absenteeism and dropout are higher among tribal children, especially during the baseline period when they become 8–11 years. Further, using the decomposition analysis, the study shows the contribution of early life circumstances to such inequality. We know that the early childhood period gets manifested as reduced educational wellbeing in the long run. Therefore, cross-sectional and panel surveys during the baseline period were similar. This finding is similar to other studies that have used the IHDS panel dataset. Additionally, the decomposition estimates were robust to the categorization of comparison groups. However, the study has its shortcomings. This study did not provide any causal inference. Further, due to the requirement of including a nationally representative panel dataset to show the contribution of early life circumstances, we have to use data from 2005 and 2012. Therefore, readers need to be cautious of the survey date while interpreting this study's findings.

| Characteristics                                      | Caste differential in educational wellbeing among children in round-II | Explained component (E) | Unexplained component (U) |
|------------------------------------------------------|---------------------------------------------------------------------|-------------------------|---------------------------|
|                                                      | Coefficient | 95% CI          | Percent                  | Coefficient | 95% CI | Percent |
| Age of children (in years)                           | −0.003      | (−0.014, 0.009) | 0.6                      | 0.018       | (−0.142, 0.178) | −3.9   |
| Gender of the children                               | 0.000       | (0.000, 0.000)  | 0.0                      | 0.042       | (−0.027, 0.111) | −9.3   |
| Stunting status of children                          | −0.012***   | (−0.018, −0.005) | 2.5                     | −0.009      | (−0.072, 0.054) | 2.0    |
| Type of school attended in round-II                  | −0.028***   | (−0.039, −0.017) | 6.2                     | −0.042      | (−0.273, 0.189) | 9.3    |
| Takes private tuition in round-II                    | −0.031***   | (−0.039, −0.023) | 6.9                     | −0.006      | (−0.030, 0.017) | 1.4    |
| Place of cooking in household                        | 0.001       | (−0.007, 0.010) | −0.3                     | −0.016      | (−0.068, 0.035) | 3.5    |
| Type of cooking fuel                                 | 0.002       | (−0.004, 0.008) | −0.4                     | −0.001      | (−0.016, 0.015) | 0.1    |
| Household sanitation condition                       | −0.026**    | (−0.036, −0.016) | 5.7                     | 0.003       | (−0.044, 0.050) | −0.7   |
| Water purification in household                      | 0.000       | (−0.001, 0.002) | −0.1                     | −0.035      | (−0.081, 0.012) | 7.6    |
| Household wealth quintile                            | −0.111***   | (−0.137, −0.084) | 24.3                    | −0.023      | (−0.200, 0.154) | 5.1    |
| Household poverty status                             | −0.022***   | (−0.036, −0.008) | 4.9                     | 0.035       | (−0.033, 0.103) | −7.6   |
| Highest educational level of male adults in household | −0.062***   | (−0.078, −0.047) | 13.7                    | −0.009      | (−0.102, 0.083) | 2.1    |
| Highest educational level of female adults in household | −0.060***  | (−0.073, −0.046) | 13.1                    | 0.029       | (−0.030, 0.088) | −6.4   |
| Gender of household head                             | 0.000       | (−0.001, 0.001) | 0.0                     | 0.039       | (−0.232, 0.310) | −8.6   |
| Religion of household head                           | −0.010**    | (−0.017, −0.004) | 2.3                     | 0.126**     | (0.003, 0.249) | −27.7  |
| Types of mass media viewed by children                | −0.004      | (−0.011, 0.003) | 0.8                     | −0.038      | (−0.095, 0.019) | 8.4    |
| Women's autonomy in child healthcare in household     | −0.003**    | (−0.007, 0.000) | 0.8                     | 0.003       | (−0.034, 0.040) | −0.7   |
| Attack/threat on household                           | 0.000       | (−0.002, 0.003) | 0.0                     | 0.003       | (−0.040, 0.300) | 12.1   |
| Solving community problem                            | −0.001      | (−0.003, 0.001) | 0.2                     | 0.118**     | (0.039, 0.197) | −26.0  |
| Domestic violence in community                       | 0.003**     | (0.000, 0.007)  | 0.8                     | −0.017      | (−0.048, 0.015) | 3.7    |
| Type of community                                    | 0.008       | (−0.002, 0.017) | 1.7                     | −0.108      | (−0.339, 0.123) | 23.8   |
| Country regions                                      | −0.002      | (−0.006, 0.003) | 0.3                     | 0.185**     | (0.030, 0.339) | −40.6  |
| Constant                                             | -           | -               | -                       | −0.334      | (−0.979, 0.312) | 73.4   |

Table 4. Detailed Blinder-Oaxaca decomposition of the caste differential in educational wellbeing score of the panel of children during IHDS round-II. (a) CI confidence interval; (b) statistical significance denoted by asterisks where *p-value < 0.1, **p-value < 0.05 and ***p-value < 0.01.
Conclusion

The missing focus on the minority groups excluded these communities from education participation. Historically, tribal children faced rejection and discrimination in terms of their backwardness. Such discrimination can be seen in inequality in their educational wellbeing due to their early life circumstances. Commendable progress has brought tribal children to schools in the past few years. Still, efforts should also be made towards reducing their discontinuation and improving their quality of education which can improve their educational wellbeing.

Quality education refers to both qualities of the school infrastructure, teacher and the learning process. Inclusion of an interactive curriculum based on their culture with proper communication at basic levels can help improve children’s educational wellbeing. Besides these factors, policies should also focus on providing targeted interventions during the early childhood period of tribal children by improving their household conditions, sensitization of parents and the community about educational opportunities and advantages during their initial years, and creating a peaceful and healthy community. Notably, early childhood conditions can be improved by providing targeted benefits to ST children through existing nutrition-security and wellbeing programs (Integrated Child Development Services, Antyodaya Anna Yojana and Poshan Abhiyan) of the Indian government.

Data availability

The study utilizes a secondary source of data that is freely available in the public domain from the Inter-University Consortium for Political and Social Research (ICPSR) data repository (https://www.icpsr.umich.edu/web/DSDR/series/507).

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| Characteristics                          | Coefficient | Percent | Explained difference of ST and Non-ST group | Coefficient | Percent | Explained difference of ST and SC group | Coefficient | Percent | Explained difference of ST and OBC group | Coefficient | Percent | Explained difference of ST and Others group | Coefficient | Percent |
|------------------------------------------|-------------|---------|---------------------------------------------|-------------|---------|------------------------------------------|-------------|---------|------------------------------------------|-------------|---------|-------------------------------------------|-------------|---------|
| Age of children (in years)               | −0.003      | 0.6     | 1.7                                         | −0.005      | 1.3     | −0.005                                   | 0.7         |         |
| Gender of the children                   | 0.000       | 0.0     | −0.5                                        | 0.000       | 0.0     | 0.0                                      | 0.0         |         |
| Stunting status of children              | −0.012*     | 2.5     | 0.006                                       | 2.0         | 0.010* | 2.4                                      | 0.018*      |         |
| Type of school attended in round-II      | −0.028*     | 6.2     | −0.111*                                     | 3.5         | −0.039* | 9.8                                      | −0.025*     |         |
| Takes private tuition in round-II        | −0.031*     | 6.9     | −0.299*                                     | 9.2         | −0.017* | 4.3                                      | −0.054*     |         |
| Place of cooking in household            | 0.001       | −0.3    | −0.008                                      | 2.6         | 0.004   | −1.1                                     | 0.005       | −0.7    |
| Type of cooking fuel                     | 0.002       | −0.4    | 0.001                                       | −0.2        | 0.007*  | −1.8                                     | −0.009      | 1.4     |
| Household sanitation condition           | −0.026*     | 5.7     | −0.011*                                     | 3.4         | −0.022* | 5.6                                      | −0.049*     | 7.3     |
| Water purification in household          | 0.000       | 0.0     | 0.004                                       | −1.2        | 0.000   | −0.1                                     | 0.002       | −0.3    |
| Household wealth quintile                | −0.111*     | 24.3    | −0.109*                                     | 34.9        | −0.092* | 22.8                                     | −0.100*     | 15.0    |
| Household poverty status                 | −0.022*     | 4.9     | −0.007                                      | 2.1         | −0.022* | 5.5                                      | −0.069*     | 10.3    |
| Highest educational level of male adults in household | −0.062* | 13.7 | −0.025* | 7.9 | −0.057* | 14.2 | −0.121* | 18.1 |
| Highest educational level of female adults in household | −0.060* | 13.1 | −0.018* | 5.6 | −0.057* | 14.3 | −0.092* | 13.9 |
| Gender of household head                 | 0.000       | 0.0     | 0.000                                       | 0.0         | 0.000   | 0.0                                      | 0.0         |         |
| Religion of household head               | −0.010*     | 2.3     | −0.013                                      | −4.1        | −0.020* | 5.0                                      | −0.001      | 0.2     |
| Types of mass media viewed by children   | −0.004      | 0.8     | 0.002                                       | −0.5        | −0.005  | 1.4                                      | 0.002       | −0.3    |
| Women’s autonomy in child healthcare in household | −0.003* | 0.8 | −0.003 | 0.9 | −0.002 | 0.4 | −0.009* | 1.3 |
| Attack/threat on household               | 0.000       | −0.1    | 0.000                                       | −0.1        | 0.001   | −0.3                                     | −0.001      | 0.1     |
| Solving community problem                | −0.001      | 0.2     | −0.006                                      | 1.8         | 0.001   | −0.1                                     | −0.002      | 0.4     |
| Domestic violence in community           | 0.003*      | −0.8    | 0.003                                       | −1.1        | 0.002   | −0.5                                     | 0.000       | −0.1    |
| Type of community                        | 0.008       | −1.7    | 0.011                                       | −3.5        | 0.002   | −0.6                                     | −0.002      | 0.3     |
| Country regions                          | −0.002      | 0.3     | 0.009                                       | −3.0        | 0.001   | −0.2                                     | −0.004      | 0.6     |
| Explained difference (E)                 | −0.360*     | 79.1    | −0.181*                                     | 57.8        | −0.330* | 82.3                                     | −0.552*     | 82.9    |
| Unexplained difference (U)               | −0.095*     | 20.9    | −0.132*                                     | 42.2        | −0.071  | 17.7                                     | −0.114*     | 17.1    |
| Total difference (T)                     | −0.454*     | −0.314* | −0.401*                                     | −0.401*     | −0.666* |

Table 5. Blinder-Oaxaca decomposition of the caste differential in educational wellbeing score between ST and Non-ST, ST and SC, ST and OBC, and ST and Others children for sensitivity analysis. (a) Statistical significance denoted by asterisks where *p-value < 0.05.
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Author contributions

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Correspondence and requests for materials should be addressed to R.P.

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