6. Discussion
Intergenerational change

In this intergenerational component evaluating anthropometric change over one generation (F1 parent and F2 child), we observed that children below ten years of age were considerably taller (~1 SD) and heavier (0.8 to 1.5 SD), while only 5-10 years old had higher BMI (~1 SD) as compared to their parents at corresponding ages. In terms of absolute units, these average Z-score increases for the 0-5 and 5-10 year age, groups respectively corresponded to 3.9 and 6.4 cm for height, 1.3 and 5.4 kg for weight, and 0.2 and 1.9 kg/m² for BMI. Significant predictors of these greater intergenerational gains (change measured as F2-F1) included parents with lower anthropometric indices and poorer WASH facilities at the time of F1 parent birth. However, the attained height, weight and BMI in F2 children was higher in subjects whose parents were taller and heavier and had greater BMI, respectively. Apart from above predictors, higher ages of parent at child birth and of children at measurement were significant predictor for greater gains (F2-F1) in height and weight and higher F1 parental education was associated with greater gains in weight and BMI. Gross State Domestic Product was also associated with greater intergenerational change in height, weight and BMI. We also observed a greater intergenerational change in height and weight of children whose grandmothers (F0) were ≤19 years (crude model) and 25-29 years (crude and multivariate models) of age at time of their F1 parent birth. Greater gains in height were also found among F2 children born to low birth weight or small for gestational age (as per Intergrowth-21st reference) F1 parents compared to children of F1 parents with birth weight ≥2500 grams.

We quantified the intergenerational change in anthropometry using two external references: WHO Z-score and IAP Z-score for 5-10 years age group. The intergenerational gains appeared lower with IAP reference but the differences were not statistically significant (non-overlapping confidence intervals; Table 17). These differences were related to the variations in medians and standard deviations of the two references, which became particularly noteworthy at older ages especially for weight and BMI (Figures 18 and 19).

These findings of substantial increase in body size of children over one generation from an urban middle class Indian population are in broad agreement with the
observed decline in anthropometric undernutrition from national surveys [4,5,7,8].

The 26% reduction in stunting over 30 years in this sample size roughly corresponds to 1% annual decline as documented for national surveys [4,5,7,8].

A scarcity of similar data precludes emphatic international comparisons. A recent analysis of a century of trends in adult human height (1896 to 1996 births) concluded that South Asians (including Indians) were among the shortest and had experienced little increase (<5 cm) during this era [27]. We could locate two directly comparable studies, one from Britain [35,36] and the other from Denmark [37]. The British Birth cohort compared offspring (mean age 8.1 years) height [35] with their parents (mean age 7.3 years) and found that children were 1 cm (0.19 SD) taller than their parents. A similar comparison for BMI among these children (mean age 6.9 years) of British cohort [36] and Danish children (age 7 years) [37] with their parents at 7 years of age documented increased gains in BMI of offspring. In the British Birth Cohort, the boys and girls were 0.16 SD (0.23 kg/m²) and 0.25 SD (0.46 kg/m²) broader (greater BMI) than their parents, respectively.

The Danish study compared the BMI in children born during 1952-1960, 1961-1970, 1971-1980 and 1980-1989 with their parents and observed that mean BMI of these children were higher by 0.1 to 0.2, 0.0 to 0.1, 0.4 to 0.5 and 0.6 to 0.7 kg/m², respectively. Both of these studies from developed countries pertain to ≥15 years earlier period; children of British cohort and Danish study for 1980-1989 could thus be comparable with our study as these cohorts might have similar or better developmental index status than our cohort. In our sample, we observed a greater intergenerational change of ~1 SD for height and BMI (only 5-10 years) (Table 17). These greater intergenerational increases (~1 SD in our cohort children will probably translate into greater absolute gain in height, weight and BMI during adulthood. These findings should inspire optimism that with rapid improvements in living conditions, anthropometric gaps from high income countries will reduce, particularly because a plateauing trend for height is evident in some developed nations [27].

Most of the other related literature pertains to the association between childhood and parental anthropometry (Tables 3 and 4). These studies from cross-sectional and longitudinal settings have shown that parental anthropometry is one of the strongest positive predictor for children anthropometry. Longitudinal studies which
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had evaluated the association between parents and children BMI documented that 1 SD increase in maternal or paternal BMI was associated with 0.06 to 0.33 SD and 0.08 to 0.44 SD increase in children at different ages, respectively [73,79-86]. In our data-set, we also found that the F1 parental anthropometry was the most consistent and significant predictor for attained F2 size (height-for-age, weight-for-age and BMI-for-age) at corresponding ages even after adjustment for parental education, wealth and WASH score (Table 23); 1 SD increase in parental BMI was associated with 0.29 SD higher in children.

Poorer parental anthropometry was associated with greater gains (change measured as F2-F1) in corresponding child anthropometry. Potential explanations for this include statistical regression to the mean, narrowing of socio-economic inequalities and greater biological response among deprived strata. This observation augurs well for attempting equity for secular increases in the height of populations. However, excessive BMI gain in children of thin parents (Figure 21), if primarily due to increased adiposity, could be providing the backdrop for the current escalation of cardio-metabolic risk factors in Indian children and adolescents [9,30,155]. This hypothesis is in concordance with the earlier observation of increased risk of diabetes mellitus in adults who were relatively thin as children but continued to become obese relative to themselves [16].

Among the various predictors associated with childhood anthropometry, parental education has shown varied relationships across countries. In a longitudinal study from UK (ALSPAC) parental education was found to be positively associated with children height [74]. For BMI, the longitudinal studies from developed countries documented that lower parental education was associated with greater BMI in children [84,97]. However, there is scant literature from Low and Middle Income countries in a longitudinal setting evaluating the association of parental education with childhood anthropometry. One longitudinal cohort from Brazil found a negative association for parental education with childhood BMI [97]. These children of 1993 Pelotas cohort with highly educated mothers were at increased risk for being overweight (P=0.01) [97]. In general, the association of parental education varied for the developing and developed countries based on the economic status. In our study, parent (F1) education was unrelated to gain in height but significant positive predictor for gain in weight (P=0.007) and BMI (P=0.015)
of children. So, these findings for parental education were in concordance with the trend reported for Low and Middle Income Countries.

For socio-economic status, different indicators such as family income, maternal or paternal occupation have been used to evaluate the association with childhood anthropometry. In longitudinal settings, most of the developed countries had a positive association with children height but negative association for BMI with family income and paternal occupation (Table 4). Children of British cohort with higher paternal occupation had significantly higher mean height and weight at 7, 11 and 16 years of age but lower mean BMI at 11 and 16 years [75,102]. A study from Canada documented that children from low and middle family income were significantly at higher risk for being overweight [98]. Children of working mother had significantly higher BMI [99,100,101]. However, all of these studies were from developed countries and only longitudinal study from Low and Middle Income Countries was from the Pelotas cohort, Brazil. This longitudinal study from Brazil found an increased risk of obesity only among boys in highest quintile of family income for both 1982 and 1993 Pelotas cohorts [97]. We did not document any significant associations between wealth score for F1 parents and either the intergenerational change (F2-F1) in anthropometry (Table 20) or the attained anthropometry in children (F2) (Table 23). This might be related to differences in the multivariate models; we adjusted for wealth score at both time points (F1 birth and F2 measurement) in order to evaluate the association between change in anthropometry over one generation and change in wealth or socio-economic status over the time period. However, in a separate analysis we documented a significant positive association of Gross State Domestic Product of Delhi (Table 22) with greater gains (changes) in height, weight and BMI of the children.

None of the related studies had studied the association of variables related to Water Supply and Sanitation (WASH) with childhood anthropometry. We found that poorer water supply and sanitation facilities at the time of F1 parent birth adjusted for current WASH status were significantly associated with greater gain in anthropometry of F2 children. In other words, an improvement in WASH status was associated with greater gains (change) in childhood anthropometry.
Another interesting biological perspective merits consideration; however paucity of relevant information in our data-set precludes an examination of this hypothesis. There is evidence suggesting that the pace of growth in childhood has accelerated, so that adult height is now reached at an earlier age [156]. In European populations, this has the effect of inflating the apparent increase in height during childhood, as children of a particular age are both taller and more advanced in developmental age [157]. It is difficult to disentangle whether the secular trend of increased physical development of children is leading to earlier developmental maturation or vice-versa. Even if early developmental maturation is leading to inflated secular height increases in children, this phenomenon could be viewed as a mediator of the underlying alterations in overall living conditions with time that influence physical growth. The advance in developmental age shifts the adiposity rebound pattern to the left in under five children, with both the age at BMI peak and the age at adiposity rebound getting earlier [92,158], independently of any secular increase in BMI [156]. This may partially explain why the BMI did not increase in the 0-5 year age group in our data-set [156].

In the absence of targeted food or nutrient supplementation in the city during the span of this study, it is not unreasonable to ascribe these intergenerational gains to improvement in general living conditions. However, from a policy perspective, filtering out important predictors is desirable. Improvement in water supply and sanitation was one such predictor. A Cochrane systematic review of cluster randomized trials, intervening for only 9-12 months also suggests that WASH interventions confer a small benefit on linear growth (~0.1 SD) in under-five children [159]. The current national impetus on “Swach Bharat Abhiyaan” is therefore timely and appropriate. In conformity with earlier experiences [10,74], higher parental literacy was a positive predictor, thereby re-emphasizing the importance of improving education. Higher ages of parents at child birth and of children at measurement were important positive predictors of intergenerational gains in height and weight. A quadratic relation of childhood anthropometry with age of child birth has been documented in pooled analyses of cohorts from Low and Middle Income countries (LMICs) [124]; our sample was probably constituted by the linear component of this association. However, both these variables are also proxies for exposure duration, thereby suggesting that sustained improvement in
living conditions resulted in greater benefit. With the available sample size in our data-set, it is virtually impossible to disentangle the individual contributions of age, period and cohort effects due to high collinearities.

Under-five children were considerably taller and heavier but only older subjects (5-10 years) were additionally broader (greater BMI) than their parents. This provides more direct evidence of the earlier postulate, based on cross-sectional comparisons [160], that children “grow up” (get taller) before “growing out” (get broader). This observation is also consistent with the increased prevalence of obesity in older children from India [30] and abroad [160-162]. The underlying mechanisms for this phenomenon are unclear to us and merit further exploration.

Grandmother’s age and Intergenerational change
There was a greater gain in height and weight of children whose grandmothers were of 25-29 years (crude and multivariate models) of age at the time of their F1 parent birth. We could not locate for comparison similar studies exploring the association between intergenerational change in anthropometry and grandmother’s age, especially from LMICs settings. It is conceivable that the observed statistically significant associations represent false positives, given the limited sample sizes in various maternal age categories. Nevertheless, it would be useful to explore other potential explanations. The significantly greater intergenerational gains in children with young (≤19 years) grandmothers in the crude but not the confounder adjusted model suggests that the association may be partly operated through socio-economic conditions. Young mothers had low education, household income and wealth (Table 28). Also in comparison to the reference category (20-24 years), 25-29 years old grandmother had lower education, household income and wealth. If this hypothesis is plausible, then it brings encouraging message for the policy makers- any anthropometric handicaps related to young mothers can be overcome in later generation with socio-economic development.

Intergenerational change in children of low birth weight or small for gestational age parents
Children of low birth weight or small for gestational age (defined using Intergrowth-21st reference) parents were taller as compared to children of parents with birth weight ≥2500 grams. However, no significant associations were evident
with the use of Swedish Medical Registry. We could not locate for comparison similar studies exploring such intergenerational associations, especially from LMIC settings.

It is conceivable that the observed statistically significant associations represent false positives, given that the small sample sizes for multivariate comparison. Nevertheless, it would be useful to explore alternative possibilities. Low birth weight subjects have been shown to have lower anthropometric indices including height in the first ten years of life [163,164]. Our observations (Table 20) had also documented that intergenerational gains were significantly higher in children whose parents had lower anthropometry at corresponding ages. This could be viewed as an encouraging observation suggesting that potential intergenerational anthropometric handicaps due to low birth weight parents can be partly overcome in the next generation with socio-economic development.

Strengths and Limitations
The main strengths of our study include the comparison of children and their parents at corresponding ages from an urban LMIC setting of relatively rapid socio-economic transition, and appropriate multi-level modelling with available confounder adjustment for both time points (F1 parent birth and F2 child measurement). The longitudinal anthropometry for the F1 parent had been carefully collected prospectively since birth. Important limitations include a somewhat small sample size based on a proportion of the currently available cohort. However, the available sample size had sufficient power (80%) to detect small intergenerational changes (0.18 to 0.22 SD) with 95% confidence. Among the parents, there was a considerably higher representation of fathers because outmigration after marriage was common in female cohort subjects (F1).

Implications for Future Research and Policy
Future research priorities could consider: (i) Confirmation in a larger sample, including adolescents; (ii) Validation of our findings in similar cohorts from other LMICs, if available; (iii) Mathematical modelling to predict expected anthropometric gains for shorter periods directly comparable to the periodicity of national surveys; and (iv) Evaluating relationships of intergenerational changes in
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anthropometric indices with children’s cardio-metabolic risk factors and body composition.

Sustained improvement in general living conditions leads to considerable (~1 SD) increases in height, weight and BMI within one generation. The current governance focus on inclusive development is therefore apt, especially if the benefits percolate preferentially to the underprivileged. Isolated vertical interventions (for example, nutrient supplementation) should only be entertained if there is convincing evidence of substantial benefit above that expected from developmental transition. Findings from the NFHS-4 survey of notable reductions in stunting and underweight with nearly stagnant or even increased wasting prevalence in some states should not fuel exaggerated concerns and action to screen for and treat for severe acute malnutrition, as this phenomenon is expected for a population undergoing development-related anthropometric transition. Vigilance may be required to address the potential of greater cardio-metabolic risk in families showing large intergenerational increases in BMI.

Conclusion

In conclusion, over one generation in an urban middle-class population, whose general living conditions had improved, under-five children have become considerably taller and heavier and 5-10 year old children have additionally become broader (greater BMI), than their parents at corresponding ages. Child populations probably “grow up” before “growing out”.

Association between Maternal Age at Birth and Offspring Anthropometry and Mortality

Offspring Growth and Undernutrition

Children of young (<19 years) mothers had lower mean height and weight from birth to 5 years of age but lower BMI only at birth. These children were also at higher risk for stunting (2 to 5 years) and underweight (birth to 2 years), but not wasting. An apparently similar disadvantage in old (≥35 years) mothers paradoxically translated into a lower risk of stunting (1, 3 and 5 years) and underweight (2 to 4 years) after adjustment for socio-economic confounders.
Cross-sectional studies from high income countries and LMICs, including a systematic review [116], concluded that young maternal age is associated with low birth weight [107,109-114] and undernutrition [11,119-122] in their children. Swamy et al. reported that offspring of older (>30 years) mothers had significantly lower mean birth weight as compared to offspring of 25-29 years mothers [108]. A study from New-Zealand documented that children of >30 years of mothers were taller and >35 years were thinner as compared to children of <30 years mothers [118]. Few studies also documented a non-linear association of maternal age with birth weight [107,109] and height-for-age [121]. They observed a lower birth weight [107,109] and height-for-age [121] for children of both young and old mothers. However, these cross-sectional studies are prone to have methodological limitations for causal inferences, particularly in relation to non-longitudinal nature of data collection and sub-optimal confounder adjustments.

Pooled analyses from longitudinal designs in LMICs and UK documented that young maternal age is associated with low birth weight children [123-125]. Our findings were consistent with these studies as offspring of young mothers had a lower mean birth weight. A pooled analysis from UK and Brazil reported an increased risk for low birth weight for >30 years mothers even after adjustment for confounders [125] whereas another pooled analysis from five LMICs [124] observed that risk for low birth weight was not significantly associated with old maternal age. In this pooled analyses, offspring of old (≥35 years) mothers had significantly higher mean birth weight as compared to the 20-24 years (reference) group after adjustment for socio-economic confounders, which is consistent with our findings [124].

In conformity with our findings the pooled analysis from five LMICs had reported a similar non-linear association between maternal age and height-for-age or stunting in the crude model and further adjustment for confounders reversed the direction of association for children of older mothers [124]. Across the five sites, they found that children of young mothers had significantly lower height-for-age Z-score and were at higher risk for stunting at 2 years of age, the only time period reported below five years apart from birth. However, adjustment for confounders increased the height-for-age Z-score and lowered the risk for stunting in children of old (≥35 years) mothers at 2 years [124], which is consistent with our analysis.
This pooled analysis had not reported on weight-for-age or underweight. However, in conformity with our findings, there was no association with wasting in under five children in the sex adjusted model or after adjustment for socio-economic confounders [124]. A systematic review of risk factors for child overweight also did not document an association between maternal age and childhood overweight [126].

The reversal of the association for height, weight and BMI in old (≥35 years) mothers after socio-economic confounders adjustment is intriguing. A similar reversal was observed in the pooled analyses from the five LMICs [124]. In our dataset, the socio-economic confounders were significantly associated with maternal age in a quadratic manner. Old (≥35 years) mothers had significantly lower education, household income, wealth and utilization of health services. This the higher risk of stunting and underweight in old mothers in the crude model is primarily a reflection of their adverse socio-economic profile. The lower risk of stunting and overweight after confounder adjustment has been postulated to be due to improved child-rearing practices by more experienced or empowered mothers [124].

In our dataset, the lower height and weight measurements in young (≤19 years) mothers were not statistically significant after five years of age. We postulate that this could primarily be related to the increased variability of anthropometric measures with increasing age; for example, the SDs increased from 2.1 cm to 5.1 cm for height, 0.4 kg to 12.2 kg for weight and 1.2 kg/m² to 4.4 kg/m² for BMI from birth to adulthood. This increased variability enhances the sample size requirements and thereby reduces the statistical power to detect observed small anthropometric differences in our dataset. It is also conceivable that other factors associated with growth may have improved among offspring of young mothers and may have substantially overcome the anthropometric handicap evident till five years age.

**Offspring mortality till 5 years of age**
In this prospective cohort study, offspring of young (≤19 years) mothers had an increased risk of mortality from the perinatal period up to five years of age, primarily after the early neonatal period. An apparently similar disadvantage in
older (≥35 years) mothers was principally a reflection of their adverse socio-economic profile.

Persistence of a higher overall mortality risk till five years of age in offspring of young mothers, despite adjustments for confounders and mediators, suggests a causal relationship. A similar association was evident for post-perinatal deaths but not for perinatal mortality. This could either reflect a true biological difference or insufficient statistical power for the perinatal mortality component, which showed broadly similar associations (29-95 deaths in various models). The crude risk for post-perinatal mortality in offspring of young mothers was attenuated by confounder (maternal education, household income and household wealth) adjustment, which was further attenuated after adjustment for mediators (place of delivery, gestation, birth weight and breastfeeding). As these biological and behavioural factors except breastfeeding were significantly associated with young maternal age, these increased risks of mortality appear to be partly operating through lower birth weight and gestation, and less utilization of healthcare services (home delivery). However, these factors are of limited relevance for the stillbirth component of perinatal death as the event is likely to determine the birth weight, gestation and access to health care rather than the converse. In contrast, the crude risk for mortality in offspring of older mothers was not evident after confounder adjustment. Older maternal age may thus not biologically predispose the offspring to higher mortality, and older mothers are also likely to be more experienced in child care practices. A recent pooled analysis from five Low and Middle Income Countries documented that children of older mothers are at a greater risk for preterm birth, but had a better nutritional status and schooling after similar socio-economic confounder adjustment [124]. In comparison to the confounder adjusted model the sample size was lower in fully (confounder and mediator) adjusted model. The available older mothers had higher education and wealth scores, which along with a lower sample size could explain the observed statistically significant association for all offspring deaths (Table 37).

Earlier cross-sectional data (Table 8), including studies from LMICs and pooled analyses from 118 Demographic and Health surveys conducted between 1990 and 2008 in 55 Low and Middle Income countries (LMICs), also documented a higher risk for stillbirths, neonatal, infant and under-five mortality in young mothers
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[120]. In addition, offspring of older mothers were also at higher risk for neonatal and infant mortality. Few studies had also adjusted for neonatal and post-neonatal mortality risk for mediators including birth weight and/or gestation. Excluding two studies [111,135], the risk for neonatal mortality was not statistically significant after adjustment for birth weight and gestation [112,113,133]. These findings are in conformity with a systematic review that showed a higher risk for young (<15 years) mothers, which was not significant after adjustment for birth weight and gestation [116]. In relation to post-neonatal mortality, a study from USA documented a significantly higher risk even after adjustment for gestation in young (<20 years) mothers [133]. The pooled analyses from 55 LMICs documented a significant U-shaped association between infant mortality and maternal age at first birth [120]. However, generally these cross-sectional studies have important limitations including variation in context and time period, sub-optimal confounder adjustments, mixing up of confounders and mediators, rare exploration of non-linear relationships and lack of prospective data collection. These limitations are likely to introduce bias.

Longitudinal studies, including from LMICs have also evaluated the association between maternal age and perinatal or neonatal or post-neonatal or infant or child mortality. In conformity with our findings, the studies from Brazil [12] and Jamaica [13] did not find any significant association between young maternal age and perinatal mortality. A pooled analysis from 6 LMICs documented a significantly higher relative risk among 15-19 years mothers for Sub-Saharan African and Latin American sites, but not for South Asian sites.

In conformity with our findings, longitudinal studies from high income countries and LMIC (Brazil) had observed that offspring of young (<20 years) mothers were at significantly higher risk for post-neonatal mortality (Table 9) [125,138-140]. Three population-based cohorts in Brazil (1982, 1993 and 2004) observed an increased risk of post-neonatal infant mortality (confounder adjusted OR 1.6; 95% CI 1.2, 2.1) in children of young (<20 years) mothers [12]. On additional adjustment for mediator variables (weight gain, antenatal care, gestation, birth weight and breastfeeding), the increased risk was not statistically significant [12]. However, the risk for early and late neonatal mortality was not significant in confounder adjusted models [12]. Another study from Nepal found a higher risk
for neonatal mortality for infants born to mothers aged 12 -15 and 16-17 years, which was not significant after adjustment for birth weight and gestation [14]. Analytic limitations in some of these longitudinal studies included mixing up of confounders and mediators in multivariate models and non-linear associations not being explored.

The Brazilian study [12] concluded that social and environmental factors may be more important than biological immaturity for this increased post-neonatal mortality. However, in our data, the increased risk for post-perinatal deaths persisted for young mothers (≤19 years) even after confounder and mediator adjustment, suggesting a causal relationship. These observed differences, among other factors, could relate to contextual variability, baseline mortality risk, social characteristics of young mothers, social and health care support systems and methodological differences (surveillance versus prospective cohort follow up, including or excluding mothers ≥30 years and restricting outcomes to infant or under-five mortality). We thus hypothesize that young maternal age predisposes the offspring to higher post-perinatal mortality, which only partly operates through socio-economic deprivation and biological-behavioural mediators (lower birth weight and gestation, and poorer access to health care); the additional precise biological mechanisms need further exploration.

Composite Maternal Age analyses

Strengths and Limitations

Strengths of our study are a large sample size from a prospective community-based South Asian setting with recording of confounders, mediators and outcomes till adult ages and appropriate analyses. Stepwise adjustment for socio-economic confounders and mediators create robustness for interpretation. Longitudinal anthropometry collection for the offspring at perspective ages provided a unique opportunity for evaluating undernutrition at various time points till 5 years of age.

The following limitations also merit consideration: (i) the relevance of four decades old data for contemporary programmes could be questioned, especially for mortality outcome. However, the findings have important programmatic implications for several regions in the country that even now have similar fertility, mortality, nutrition profile, socio-economic, water supply and sanitation and health
access indicators. Further, there was no evidence of secular changes in associations in mortality data spread over 2-3 decades. [12,120]; (ii) data are missing for some variables; however, most of this pertains to mediators rather than confounders and this is a familiar scenario in large prospective cohort studies from LMICs; (iii) there may be some residual unadjusted confounding; (iv) a separate category of early neonatal deaths was not available for mortality analysis. In community settings in India it is challenging to discern a live newborn from a stillbirth within the first day of delivery.

*Implication for Policy and Research*

Offspring of teenage mothers in LMICs not only have poorer child survival, but are also nutritionally disadvantaged at birth and during childhood, and have reduced human capital [124]. Measures to prevent young motherhood are currently underrated as public health interventions; these should receive greater prominence and investments in the proposed child health and survival agenda [165]. Teenage marriages and pregnancies are declining in India [8,106]. However, as per latest national estimates, 32% of all women and 40% of those illiterate are married before 18 years [106]. In the recent national survey (NFHS-4) (data released only for 21 states), the percentage of women aged 15-19 years who had begun childbearing ranged from 2% to 19% for different states [8]. The intervention thus still retains importance, particularly in rural and tribal regions which are more disadvantaged. Further, greater care and support is necessitated for their vulnerable children in public health programmes. It would be unethical to conduct randomized controlled trials on this subject. However, operational and behavioural research to prevent young motherhood in different contexts is desirable. Pooled analyses from recent similar cohorts in LMICs could confirm the utility of this intervention with improvements in access to health care.

*Conclusion*

In conclusion, children of young (≤19 years) mothers are at higher risk for stunting (2 to 5 years) and underweight (birth to 2 years) but not wasting. An apparently similar disadvantage in old (≥35 years) mothers translates into a lower risk of stunting (1, 3 and 5 years) and underweight (2 to 4 years) after adjustment for socio-economic confounders, possibly due to their greater experience in child rearing. Offspring of young mothers also had an increased risk of mortality from
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the perinatal period up to five years of age, primarily after the early neonatal period. An apparently similar disadvantage in older (≥35 years) mothers was principally a reflection of their adverse socio-economic profile. Measures to prevent young motherhood should therefore receive greater prominence and investments in the child health and survival agenda.