POSHAN
Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India
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EDITOR'S NOTE

In this 43rd issue of the POSHAN Abstract Digest, we bring to you a collection of interesting articles on various topics pertaining to maternal and child nutrition. This short issue features studies that assess annual trends in wasting and anemia among children under the age of 5 years using national survey data, the relationship of anthropometric failure with child mortality, and the effectiveness of participatory women's groups scaled up by the public health system to improve birth outcomes. There are also two studies focusing on the role of community health workers (CHWs), namely in providing maternal nutrition counselling to improve child nutrition, and the effect of home visits on infant health.

Below is the list of peer-reviewed articles. Please click on the title if you wish to go straight to the article or scroll down to explore the abstracts in the pages that follow.

Stay safe and enjoy reading!

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Effect of Milk Supplementation on the Status of Micronutrients Among Rural School Children Aged 5–19 Years in a Tribal Predominating District of India
Kumar et al. 2021. *BMJ Nutrition, Prevention & Health*, e000223.

Specificity Matters: Unpacking Impact Pathways of Individual Interventions Within Bundled Packages Helps Interpret the Limited Impacts of a Maternal Nutrition Intervention in India
Kachwaha et al. 2021. *The Journal of Nutrition*, nxab390.

PEER-REVIEWED

Methods for Assessing Seasonal and Annual Trends in Wasting in Indian Surveys (NFHS-3, 4, RSOC & CNNS)

Johnston, R., Dhamija, G., Kapoor, M., Agrawal, P.K., and A. de Wagt. 2021. "Methods for Assessing Seasonal and Annual Trends in Wasting in Indian Surveys (NFHS-3, 4, RSOC & CNNS)." *PLoS ONE* 16(11): e0260301. https://doi.org/10.1371/journal.pone.0260301

Wasting in children under-five is a form of acute malnutrition, a predictor of under-five child mortality and of increased risk of future episodes of stunting and/or wasting. In India, national estimates of wasting are high compared to international standards with one in five children found to be wasted. National surveys are complex logistical operations and most often not planned or implemented in a manner to control for seasonality. Collection of survey data across differing months across states introduces seasonal bias. Cross-sectional surveys are not designed to collect data on seasonality, thus special methods are needed to analyse the effect of data collection by month. We developed regression models to estimate the mean weight for height (WHZ), prevalence of wasting for every month of the year for an average year and an overall weighted survey estimates controlling for the socio-demographic variation of data collection across states and populations over time. National level analyses show the mean WHZ starts at its highest in January, falls to the lowest in June/August and returns towards peak at year end. The prevalence of wasting is lowest in January and doubles by June/August. After accounting for seasonal patterns in data collection across surveys, the trends are significantly different and indicate a stagnant period followed by a decline in wasting. To avoid biased estimates, direct comparisons of acute malnutrition across surveys should not be made unless seasonality bias is appropriately addressed in planning, implementation or analysis. Eliminating the seasonal variation in wasting would reduce the prevalence by half and provide guidance towards further reduction in acute malnutrition.

Associations of Single Versus Multiple Anthropometric Failure With Mortality in Children Under 5 Years: A Prospective Cohort Study

Gausman, J., Kim, R., and S.V. Subramanian. 2021. "Associations of Single Versus Multiple Anthropometric Failure With Mortality in Children Under 5 Years: A Prospective Cohort Study." *SSM - Population Health* 16: 100965. doi: https://doi.org/10.1016/j.ssmph.2021.100965

Background/objectives: Stunting, underweight, and wasting are used to monitor nutritional status in children, but they do not identify children with concurrent anthropometric failures (AF). Our study estimates the association between AF and mortality in children with single versus multiple failures, then calculates the percentage of child deaths attributable to AF. **Subjects/methods:** Using data from a prospective, longitudinal study of 3605 children from age 1 to age 5 years in Ethiopia and India, we estimate the association between AF and mortality using conventional definitions (stunting, underweight, and wasting) and the mutually exclusive categories of stunted only underweight only, wasted only, stunted and underweight (SU), underweight and wasted, and stunted, underweight, and wasted (SUW), adjusting for socioeconomic status and other demographic variables. Last, we calculate the population attributable fraction. **Results:** Children who were SU and SUW had 3.20 (95% CI: 1.69, 6.06; $p < 0.001$) and 5.52 (95% CI: 2.25, 13.56; $p < 0.001$) times the odds of death in fully adjusted models by Round 2 compared to children with no failure, while no increased mortality risk was found among children with other categories of failure. We estimate that 42.69% of child deaths can be attributed to children who are SUW (17.02%) or SU (25.67%), accounting for nearly 80% of child deaths from AF. **Conclusions:** This study provides new insight to programs and policy to better identify children most at risk of malnutrition-related mortality.

Anemia Among Children Under 5 Years in India: A District-Level Spatial Analysis Using NFHS-5 Data

Puranik, A., and S. N. 2021. "Anemia Among Children Under 5 Years in India: A District-Level Spatial Analysis Using NFHS-5 Data." *Asia Pacific Journal of Public Health*. doi: 10.1177/10105395211058288.

The 2015/2016 National Family Health Survey (NFHS-4) revealed that the prevalence of anemia among children under 5 years is 58% in India. Lack of nutritional supplementation and lack of health care facilities are found to be important influential factors of anemia among children. We aimed to examine district-level spatial heterogeneity and clustering of associated factors with childhood anemia in India. Geographically weighted regression was applied on the NFHS-5 data for 335 districts. Factors such as prevalence of nutritional supplementation in children and mothers, birth order, antenatal care, diarrhea in children, and stunting were found to be significantly associated. Spatial scan statistics technique identified 3 significant local spatial clusters of anemia. This study provides findings based on the latest available data which can further assist in the design and execution of tailor-made policies.

Early Childhood Undernutrition, Preadolescent Physical Growth, and Cognitive Achievement in India: A Population-Based Cohort Study

Soni, A, Fahey, N., Bhutta, Z.A., Li, W., Frazier, J.A., Moore Simas, T., Nimbalkar S.M., and J.J. Allison. 2021. "Early Childhood Undernutrition, Preadolescent Physical Growth, and Cognitive Achievement in India: A Population-Based Cohort Study." *PLoS Med* 18(10): e1003838. https://doi.org/10.1371/journal.pmed.1003838

Background: There is a lack of nationally representative estimates for the consequences of early childhood undernutrition on preadolescent outcomes in India. Understanding this relationship is helpful to develop interventions that not only prevent child undernutrition but also mitigate its consequences. **Methods and findings:** In this cohort study, we analyzed prospectively gathered data from 2 waves of the India Human Development Survey (IHDS) to investigate the association of undernutrition during early childhood (0 to 5 years) in 2004 to 2005 with physical and cognitive outcomes during preadolescent (8 to 11 years) years in 2011 to 2012. These surveys interviewed 41,554 households across all 33 states and union territories in India in 2004 to 2005 and reinterviewed 83% of the households in 2011 to 2012. Primary exposure was assessed using the Composite Index of Anthropometric Failure (CIAF) based on 2004 to 2005 survey. Primary outcomes were short stature (height-for-age z-score [HAZ] <−2), thinness (body mass index [BMI] <18.5 kg/m2), reading, and arithmetic skills during preadolescence based on the 2011 to 2012 survey. Survey-weighted generalized linear models were used, and effect modification based on child sex and sociodemographic variables were evaluated using 3-way interaction terms. Of the 7,868 children included in this analysis, 4,334 (57.3%) were undernourished. Being undernourished was associated with increased odds of short stature (odds ratio [OR] 1.73, 95% confidence interval [CI] 1.45 to 2.06) and thinness (OR 1.52, 95% CI 1.33 to 1.73) during the preadolescent period, while it was associated with decreased odds of achieving a higher reading (cumulative odds ratio [cumOR]: 0.76, 0.66 to 0.87) and arithmetic (cumOR: 0.72, 0.63 to 0.82) outcomes. The disparity in outcomes based on CIAF increased with age, especially for female children. Increased level of female education within the household reduced the disadvantages of undernutrition among female children. Study limitations include observational and missing data, which limit our ability to draw strong causal inferences. **Conclusions:** In this study, we found that early child undernutrition was associated with several adverse preadolescent physical and cognitive outcomes, especially among female children. Improved female education mitigates this association. Female education promotion should assume a central role in Indian public health policy making.

Effect of a Maternal Counselling Intervention Delivered by Community Health Workers on Child Nutrition: Secondary Analysis of a Cluster Randomised Controlled Trial in India

Ali, I.A., Shet, A., Mascarenhas, M., and M.R. Galanti. 2021. "Effect of a Maternal Counselling Intervention Delivered by Community Health Workers on Child Nutrition: Secondary Analysis of a Cluster Randomised Controlled Trial in India." *BMC Public Health* 21. doi: https://doi.org/10.1186/s12889-021-11998-w

Background: India suffers from a double burden of malnutrition and anaemia. The Karnataka anaemia project indicated that a counselling intervention delivered by community health workers improved anaemia cure rates. **Objective:** To evaluate the effect of maternal counselling on nutritional aspects of anaemia prevention. **Methods:** Secondary analysis of a cluster randomised controlled trial (55 simultaneously randomised villages using random number generator in Chamrajnagar district, Northern India). In the intervention group mothers of anaemic children received five monthly counselling sessions plus usual care (iron and folic acid supplements), while mothers of anaemic children in the control group received usual care alone. Daily intake of nutrients related to anaemia prevention, i.e. iron (mg) and vitamin C (mg), was estimated using the 24-h dietary recall method at baseline and 6 months follow-up. Linear and logistic mixed regression models were used to assess between-groups difference in changes in nutrients intake from baseline to end of follow-up. Data collectors and analysts were blinded to the group assignment. **Results:** Participants were 534 (intervention *n* = 303; usual treatment *n* = 231) anaemic children, aged 1 to 5 years and their caregivers, of whom 521(intervention *n* = 299 from 28 villages; usual treatment *n* = 222 from 27 villages) were retained at 6 months follow-up and included in the analysis. This study provides inconclusive evidence of improvement in the intake of nutrients that prevent anaemia from baseline to follow-up among the intervention compared to the control group; increase in iron intake was 0.24 mg/day (95% CI -0.67; 1.15) and increase in vitamin C intake was 4.61 mg/day (95% CI -0.69, 9.91). Although encouraging, it is notable that the overall intake of nutrients that prevent anaemia remained well below the national recommended daily allowance. **Conclusion:** This study provides inconclusive evidence of the effect of parental counselling on nutritional aspects of anaemia prevention. The results highlight the need to devise multi-component anaemia-prevention interventions that include facilitators of the availability of nutritious food and should be evaluated in studies that are adequately powered to detect nutritional changes.

Effectiveness of Participatory Women's Groups Scaled Up by the Public Health System to Improve Birth Outcomes in Jharkhand, Eastern India: A Pragmatic Cluster Non-Randomised Controlled Trial

Nair, N., Tripathy, P.K., Gope, R., Rath, S., Pradhan, H., Rath, S., Kumar, A., Nath, V., Basu, P., Ojha, A., Copas, A., Houweling, T.A.J., Haghparast-Bidgoli, H., Minz, A., Baskey, P., Ahmed, M., Chakravarthy, V., Mahanta, R., and A. Prost. 2021. "Effectiveness of Participatory Women's Groups Scaled Up by the Public Health System to Improve Birth Outcomes in Jharkhand, Eastern India: A Pragmatic Cluster Non-Randomised Controlled Trial." *BMJ Global Health* 6:e005066. doi: http://dx.doi.org/10.1136/bmjgh-2021-005066

Introduction: The WHO recommends community mobilisation with women's groups practising participatory learning and action (PLA) to improve neonatal survival in high-mortality settings. This intervention has not been evaluated at scale with government frontline workers. **Methods:** We did a pragmatic cluster non-randomised controlled trial of women's groups practising PLA scaled up by government front-line workers in Jharkhand, eastern India. Groups prioritised maternal and newborn health problems, identified strategies to address them, implemented the strategies and evaluated progress. Intervention coverage and quality were tracked state-wide. Births and deaths to women of reproductive age were monitored in six of Jharkhand's 24 districts: three purposively allocated to an early intervention start (2017) and three to a delayed start (2019). We monitored vital events

prospectively in 100 purposively selected units of 10 000 population each, during baseline (1 March 2017–31 August 2017) and evaluation periods (1 September 2017–31 August 2019). The primary outcome was neonatal mortality. **Results:** We identified 51 949 deliveries and conducted interviews for 48 589 (93.5%). At baseline, neonatal mortality rates (NMR) were 36.9 per 1000 livebirths in the early arm and 39.2 in the delayed arm. Over 24 months of intervention, the NMR was 29.1 in the early arm and 39.2 in the delayed arm, corresponding to a 24% reduction in neonatal mortality (adjusted OR (AOR) 0.76, 95% CI 0.59 to 0.98), including 26% among the most deprived (AOR 0.74, 95% CI 0.57 to 0.95). Twenty of Jharkhand's 24 districts achieved adequate meeting coverage and quality. In these 20 districts, the intervention saved an estimated 11 803 newborn lives (min: 1026–max: 20 527) over 42 months, and cost 41 international dollars per life year saved.
Conclusion: Participatory women's groups scaled up by the Indian public health system reduced neonatal mortality equitably in a largely rural state and were highly cost-effective, warranting scale-up in other high-mortality rural settings.

Evaluating the Effectiveness of Community Health Worker Home Visits on Infant Health: A Quasi-experimental Evaluation of Home Based Newborn Care Plus in India

Newton-Lewis T.A., and G. Bahety. 2021. "Evaluating the Effectiveness of Community Health Worker Home Visits on Infant Health: A Quasi-experimental Evaluation of Home Based Newborn Care Plus in India." *Journal of Global Health* 11:04060. doi: 10.7189/jogh.11.04060

Background: Home visits by community health workers are promoted to improve the coverage and uptake of evidence-based newborn services and behaviours. However, evidence on the effectiveness of these home visits delivered through government systems at scale is limited, as is evidence from the post-neonatal period. From 2013 to 2017, the Government of India piloted an intervention called Home Based Newborn Care Plus with the goal of reducing pneumonia- and diarrhoea-related morbidity and malnutrition. Village-based Accredited Social Health Activists were incentivised to make quarterly home visits to infants between three and 12 months of age. After the pilot, the intervention was adapted and scaled up nationally (with an additional visit at 15 months of age) as a new programme called Home Based Care for Young Child. **Methods:** The study used a quasi-experimental, difference-in-differences method to assess the quantitative impact on key outcome indicators by comparing changes over time in treatment districts with matched control districts. This was supplemented by a quantitative health worker survey and qualitative data collected at worker and community level. **Results:** The intervention led to a significant increase in the number of home visits, and their content became more aligned with Home Based Newborn Care Plus protocols. However, absolute levels of coverage remained low. The intervention had no detectable effect on the key outcomes of feeding practices, handwashing, iron and folic acid and oral rehydration solution supplementation, growth monitoring, and immunisation. **Conclusions:** Given the scale up of Home-Based Care for Young Child, there is a need to identify appropriate and comprehensive support for Accredited Social Health Activists to attain high coverage and quality and deliver impact. This will require reconsidering current design elements (such as incentives) and solving the underlying demand side and system level challenges (such as workload and supply chains) constraining Accredited Social Health Activists.

Effect of Milk Supplementation on the Status of Micronutrients Among Rural School Children Aged 5–19 Years in a Tribal Predominating District of India

Kumar, C., Rana, R.K., Kumar, M., Kujur, A., Kashyap, V., Singh, S.B., Sagar, V., Kumari, N., and D. Kumar. 2021. "Effect of Milk Supplementation on the Status of Micronutrients Among Rural School Children Aged 5–19 Years in a Tribal Predominating District of India." *BMJ Nutrition, Prevention & Health*, e000223. doi: 10.1136/bmjnph-2020-000223

Background: In the tribal state of Jharkhand, there have been very few studies on micronutrient deficiency and how it is addressed among school children. This study was conceived and undertaken to assess the effect of milk supplementation on the micronutrient status of school children. **Design:** A comparative observational study was conducted among school children of a tribal district in India during 2017–2018. Two groups of schools/clusters were randomly selected, one with milk supplementation and the other without supplementation. A total of 318 children from the two groups of schools were recruited for biochemical analysis of certain micronutrients, such as calcium, vitamin D, vitamin B12 and iron (haemoglobin level), using cluster random sampling. Data were analysed using SPSS V.20.0 software, and multiple logistic regression analysis was done to determine the predictors of serum calcium and vitamin B12 level among school children. **Results:** Almost all children from both groups had vitamin D deficiency. A higher risk of lower serum vitamin B12 level (OR 2.59, 95% CI 1.61 to 4.16) and calcium level (OR 3.36, 95% CI 1.74 to 6.49) was observed in children of the control group. The difference in the proportion of anaemia in the two study groups was found to be statistically insignificant. Milk consumption was found to be the only significant predictor of normal vitamin B12 and calcium level in the present study. **Conclusions:** In this study, it was concluded that milk consumption may help in improving the calcium and vitamin B12 status of school children of a tribal state, whereas it does not have any significant effect on vitamin D level

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Specificity Matters: Unpacking Impact Pathways of Individual Interventions Within Bundled Packages Helps Interpret the Limited Impacts of a Maternal Nutrition Intervention in India

Kachwaha, S., Nguyen, P.H., Tran, L.M., Avula, R., Young, M.F., Ghosh, S., Forissier, T., Escobar-Alegria J., Sharma, P.K., Frongillo, E.A., and P. Menon. 2021. "Specificity Matters: Unpacking Impact Pathways of Individual Interventions Within Bundled Packages Helps Interpret the Limited Impacts of a Maternal Nutrition Intervention in India," *The Journal of Nutrition*, nxab390.
doi: https://doi.org/10.1093/jn/nxab390

Background: To address gaps in coverage and quality of nutrition services, Alive & Thrive (A&T) strengthened the delivery of maternal nutrition interventions through government antenatal care (ANC) services in Uttar Pradesh, India. The impact evaluation of the A&T interventions compared intensive (I-ANC) to standard (S-ANC) areas and found modest impacts on micronutrient supplementation, dietary diversity, and weight gain monitoring. **Objectives:** This study examined intervention-specific program impact pathways (PIP) and identified reasons for limited impacts of the A&T maternal nutrition intervention package. **Methods:** We used mixed methods: frontline workers surveys (FLWs, n~500); counseling observations (n = 407); and qualitative in-depth interviews with FLWs, supervisors, and block-level staff (n = 59). We assessed seven PIP domains: training and materials, knowledge, supportive supervision, supply chains, data use, service delivery, and counseling. **Results:** Exposure to training improved in both I-ANC and S-ANC areas with more job aids used in I-ANC versus S-ANC (90 vs.70%), but gaps remained for training content and refresher trainings. FLW's knowledge improvement was higher in I-ANC than S-ANC (22–36 percentage points), but knowledge on micronutrient supplement benefits and recommended foods was insufficient (<50%). Most FLWs received supervision (>90%), but supportive supervision was limited by staff vacancies and competing work priorities. Supplies of iron-folic acid and calcium supplements were low in both areas (30–50% stock-outs). Use of monitoring data during review meetings was higher in I-ANC than S-ANC (52 vs. 36%), but was constrained by time, understanding, and data quality. Service provision improved in both I-ANC and S-ANC areas, but counseling on supplement benefits and weight gain monitoring were low (30–40%). **Conclusions:** Systems-strengthening efforts improved maternal nutrition interventions in ANC, but gaps remained. Taking an intervention-specific perspective to the PIP analysis in this package of services was critical to understand how common and specific barriers influenced overall program impact.

NON-PEER REVIEWED

The Coexistence of Dual Malnutrition at Household Level in India: Evidence From the Comprehensive National Nutrition Study 2016–18

Porwal, A., Ashraf, S., Ramesh, S., Khan, N., Johnston, R., Sarna, A., Acharya, R., and P. Agarwal. 2021. "The Coexistence of Dual Malnutrition at Household Level in India: Evidence From the Comprehensive National Nutrition Study 2016–18." *Research Square*. doi: 10.21203/rs.3.rs-997252/v1

Objective: To examine the prevalence of DBM at national, state, regional level and its proximate determinants in households with a mother and child under 5 years of age. **Methods:** The present study includes data on 38,060 children under 5 years of age and their biological mothers, drawn from the nationally representative Comprehensive National Nutrition Survey (CNNS) of children and adolescents aged 0–19 years in India. The outcome variable for this study was the double burden of malnutrition at the household level. A child was classified as stunted if the height was at least -2SD below the mean for their age. A mother with a body mass index (BMI) of more than or equal to 25kg/m2 (BMI ≥ 25 kg/m2) was considered as overweight. A binary variable with coexistence of both conditions was created and categorized as 1 (existence of stunted child and overweight mother), and 0 otherwise. Multivariate regression analysis was used to examine the association between DBM and covariates at maternal, child and household level. **Results:** 3.4% of households were found to be with DBM, with higher prevalence in urban areas (6.2%) as compared to rural areas (2.5%). Inter-state and regional variations were present in the prevalence of DBM. The proportion of DBM was higher in households with mothers aged 30 years or more, mothers not working and those who had cesarean births. Prevalence of DBM was found to be higher in urban area and rich households. **Conclusion:** This study shows the prevalence of DBM and its proximate determinants. These findings highlight the need for a comprehensive nutrition programme that targets both undernutrition and overnutrition. While formulating standalone policies for both forms of malnutrition is relatively easier, customized policies and programmes are needed to combat the conflicting situation of dietary excess and deprivation at the household level.

UPCOMING EVENTS & DEADLINES

Agriculture, Nutrition, and Health (ANH) Academy

ANH is currently inviting proposals for Learning Lab sessions and Side Events that align with or more of the ANH2022 topics listed on the website. The deadline for proposals is March 14, 2022 at 23:59 GMT.

Where: June 20-July 1, 2022
Where: Online
For more information: https://www.anh-academy.org/anh-academy/academy-week/anh2022

Nutrition 2022 Live Online

Nutrition 2022 Live Online, the American Society for Nutrition's flagship annual meeting, will be held virtually June 14-16, offering new, original science presentations, featured sessions, award lectures and recognition, professional development, and networking/Groups Engaging Members (GEM) functions.

When: June 14-16, 2022
Where: Online
For more information: https://nutrition.org/nutrition-2022/

22nd International Congress of Nutrition (ICN)

The 22nd International Congress of Nutrition (ICN) will be held in Tokyo, Japan, in December of 2022. ICN is a meeting of the International Union of Nutritional Sciences (IUNS) that takes place every four years, the tenth of which was successfully held in Kyoto in 1975.

When: December 6-11, 2022
Where: Tokyo, Japan
Call for abstracts: November 12, 2021-March 18, 2022
For more information: https://icn22.org/

ABOUT POSHAN

Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India (POSHAN) is a multi-year initiative that aims to build evidence on effective actions for nutrition and support the use of evidence in decision-making. It is supported by the Bill & Melinda Gates Foundation and led by IFPRI in India.

ABOUT ABSTRACT DIGEST

In each issue, the POSHAN Abstract Digest brings you some of the new and noteworthy studies on maternal and child nutrition. It focuses on India-specific studies and also brings to you other relevant global or regional literature with broader implications for maternal and child nutrition. The Abstract Digest is based on literature searches to identify selected studies that we think are most relevant to nutrition issues in India and to Indian programs and policies. We share with you a collection of abstracts from articles published in peer-reviewed journals, as well as selected non-peer-reviewed articles by researchers in reputed academic and/or research institutions and which demonstrated rigor in their research objectives, methodology, and analysis. The abstracts in this document are reproduced in their original form from their source, and without editorial commentary about specific articles.

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