Milk Consumption and Nutrition Outcomes

A review of the recent literature

Animal milk, particularly cow's milk, has been identified as a food-based strategy for promoting child growth. Milk is nutrient-rich, containing all essential amino acids and micronutrients such as calcium, magnesium, and vitamins B1, B2, and B12 (see *Table 1*).

The role of milk and dairy products in the provision of these nutrients is particularly important in contexts where access or bioavailability through plant-based foods is otherwise limited (*Choudhury and Headey 2018; Zaharia 2021; Headey, Hirvonen, and Hoddinott 2018*).

Table 1 Summary of nutrient composition of milk in the US vs India.

Serving size (100 g)	Cow Milk Amount per serving USDA*	Cow Milk Amount per serving NIN ††	Buffalo Milk Amount per serving NIN **
Calories	61	73	107
Total Fat	3.2 g	4.5 g	6.6 g
Saturated Fat	1.86 g	Not Available	Not Available
Trans Fat	0.1 g	Not Available	Not Available
Cholesterol	12 mg	Not Available	Not Available
Sodium	38 mg	25.5 mg	30.1 mg
Total Carbohydrate	4.6 g	4.9 g	8.4 g
Lactose	4.8 g	4.3 g	4.1 g
Total Sugars	4.8 g	4.9 g	5.3 g
Protein	3.3 g	3.3 g	3.7 g
Calcium	123 mg	118 mg	121 mg
Vitamin B12	0.54 μg	Not Available	Not Available
Vitamin B1	0.06 mg	0.03 mg	0.05 mg
Vitamin B2	0.14 mg	0.11 mg	0.13 mg
Vitamin A	32 μg	58.3 μg	49.8 μg
Potassium	150 mg	115 mg	109 mg
Magnesium	11.9 mg	8.3 mg	10.1 mg

* Values were derived from the United States Department of Agriculture (USDA) Food Table using 24 samples of "Milk, whole, 3.25% milkfat, with added vitamin D".

†† Values were derived from the NIN Indian Food Composition Tables 2017 using samples from 6 regions of "milk, whole, cow".

** Values were derived from the National Institute of Nutrition (NIN) Indian Food Composition Tables 2017 using samples from 6 regions of "milk, whole, buffalo".

Surprisingly few studies have evaluated the role of milk and dairy on nutritional outcomes, particularly stunting and anemia, in low- and middle-income countries (*Herber et al. 2020; Headey, Hirvonen, and Hoddinott 2018*). We found one systematic review that summarized the literature on dairy and height (*Kouvelioti, Josse, and Klentrou 2017*). Of the 15 studies identified in that review, only two found significant effects on height in children, one in China and one in Chile (*Albala et al 2008; Du et al 2004*).

In the past five years (2017 to 2022), we were not able to identify any randomized-controlled trials of the impact of milk/dairy on nutritional outcomes. Only one study evaluated this association longitudinally during this time frame. We summarized literature assessing the association between dairy consumption and nutritional outcomes, focusing on stunting and anemia (*Table 2*). Much of the relevant literature focused on children. **We found associations between dairy consumption and stunting to be relatively consistent (though sparse), with dairy consumption promoting linear growth.** However, the link between dairy and anemia was mixed. Dairy consumption was found to be **either not significantly associated or associated with an increased risk of anemia.** These findings were partially attributed to milk's role in inhibiting the absorption of heme and non-heme iron from other dietary sources (*Kejo et al. 2018*). We were not able to identify any studies that evaluated the nutritional content of "milk powder" as compared to liquid milk or the comparative effects of milk powder vs. liquid milk on stunting or anemia.

Table 2 Summary of 9 studies evaluating milk and dairy consumption and undernutrition since 2017.

Reference	Country	Intervention	Study Design	Target Population	Findings
Vanderhout and Corsi 2021	India	None – observational study Consumption of milk (tinned, powdered, or fresh) in the past 24 hours	Population-based, nationally representative cross-sectional study (NHFS-4) Sample size = 107,639	Children aged 6-59 months	Children who had consumed dairy milk within the past 24 hours had reduced odds of underweight compared to children who did not: OR= 0.95, 95% CI (0.92, 0.98) and stunting OR = 0.93, 95% CI (0.90, 0.96)
Zaharia 2021	Nepal, Bangladesh, Uganda	None – observational study Consumption of dairy in the past 24 hours	Longitudinal Sample size by country: 1,564 for Nepal 2,413 for Bangladesh 2,348 for Uganda	Children aged 6-24 months	Nepal: Children who consumed dairy 1 year before LAZ measurement had significantly higher LAZ scores [b coefficient = 0.23, 95% CI (0.05, 0.42)] and lower stunting rates [b coefficient stunting = -0.08, 95% CI (-0.12, -0.03)] compared to children who did not consume dairy. Bangladesh: Children who consumed dairy 6 months before LAZ measurement had significantly higher LAZ scores [b coefficient = 0.15, 95% CI (0.05, 0.25)] and lower stunting rates [b coefficient = -0.06, 95% CI (-0.11, 0.00)] compared to children who did not consume dairy. Uganda: Contemporaneous consumption of dairy was associated with decreased stunting in children between 6 and 12 months of age [b coefficient = -0.11, 95% CI (-0.18, -0.03)].
Herber et al. 2020	Pooled sample of 68 countries	None – observational study Consumption of milk (tinned, powdered, or fresh) in the past 24 hours	Nationally representative cross-sectional surveys (DHS phases 2 through 7) Sample size by outcome: 668,463 for weight-for-length score 693,376 for weight-for-age score 673,177 for height-for-age score	Children aged 6-59 months	Milk consumption was associated with reduced probability of being underweight [b coefficient = -0.0140, p-value: <0.001], being stunted [b coefficient = -0.0194, p-value: <0.001], as well as severely underweight and severely stunted [same b coefficient for both = -0.0173, p-value: <0.001]. After stratifying by wealth quintiles, no significant association was found between milk consumption and any growth outcomes in children from the poorest quintile. However, in the wealthiest quintile, milk was associated with increased weight-for-age and height-for-age z-scores. Moreover, milk consumption was associated with reduced probability of underweight or stunting among children in the wealthiest quintile [b coefficient underweight = -0.0211, p-value: <0.001 and b coefficient stunting = -0.0336, p-value: <0.001].

Table 2 (contd.) Summary of 9 studies evaluating milk and dairy consumption and undernutrition since 2017.

Reference	Country	Intervention	Study Design	Target Population	Findings
Kant et al. 2019	India	None – observational study Frequency of consumption of dairy products	Community-based cross-sectional study Sample size = 1,226	Adult males	The association between consumption of milk/dairy products occasionally or never with anemia was not significant when compared with those who consumed these products either daily or more than once a week.
Mohammed, Larijani, and Esmaillzadeh 2019	Ethiopia	None – observational study Milk consumption in the past 24 hours	Nationally representative cross-sectional survey (DHS 2016) Sample Size = 2,902	Children aged 6-23 months	Milk consumption was not significantly associated with co-occurrence of anemia and stunting.
Xu et al. 2019	China	None – observational study Dairy included full-fat milk, skimmed/low-fat milk, milk powder, yogurt and cheese.	Nationally representative cross-sectional survey (Chinese Nutrition and Health Surveillance national survey, 2010-2012) Sample size = 28,250	Children and adolescents aged 6-17 years	Dairy consumption >= 1 time per day among boys was associated with reduced odds of stunting [OR = 0.62, 95% CI (0.42, 0.91)] and wasting [OR = 0.74, 95% CI (0.60, 0.92)] compared to 0 times per week consumption. Consuming dairy 2-6 times per week was associated with reduced risk of stunting among girls compared to 0 times per week [OR = 0.57, 95% CI (0.38, 0.86)]. However, there was no significant association between dairy consumption and wasting among girls.
Choudhury and Headey 2018	Bangladesh	None – observational study Treatment: households with lactating dairy cows that have produced milk over the past 12 months Placebo: Households with cows that have not produced milk in the past 12 months Control: Households that do not own any dairy cows	Nationally representative cross-sectional survey (Bangladesh Integrated Household Survey in rural areas in 2011/12 and 2015) Sample Size = 1,596	Children aged 0–23 months	Exposure to milk production (treatment group) was associated with increased HAZ scores in children up to 29 months compared to the control. This association was not significant for children in the placebo group compared to the control. Similarly, exposure to milk production was negatively associated with stunting in the 6-23 month and 18-29 month age groups compared to the control. No significant association was found for the placebo group. The authors interpreted the findings to suggest that milk consumption has its largest impact in the first 1000 days and that milk production not cattle ownership contributes to growth in early childhood.

Table 2 (contd.) Summary of 9 studies evaluating milk and dairy consumption and undernutrition since 2017.

Reference	Country	Intervention	Study Design	Target Population	Findings
Headey, Hirvonen, and Hoddinott 2018	49 countries in 7 regions	None – observational study Consumption of dairy in the past 24 hours	DHS data phases 5 and 6 (surveys 2006 – 2014) Sample size = 130,432	Children aged 6-23 months	Dairy consumption was associated with lower stunting among children aged 18-23 months [b coefficient = -0.034, p-value: <0.001].
Kejo et al. 2018	Tanzania	None – observational study Whether milk is regularly consumed or not	Community-based cross-sectional study Sample size = 436 mother-child pairs	Children aged 6-59 months	Children who consumed cow's milk had increased odds of anemia compared to children who did not consume cow's milk [OR = 2.5, 95% CI (1.1, 5.2)].

Abbreviations:
CI: Confidence Interval
DHS: Demographic and Health Surveys
OR: Odds Ratio

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Search Criteria

["milk" OR "milk powder" OR "dairy"] AND ["stunting" OR "anemia"] in Google Scholar restricted to literature published from 2017 to 2022.

The search yielded 6,250 results of which 26 articles were fully reviewed. Of the 26 studies, 9 were included in the final report. Milk from large livestock sources such as cow, buffalo, goat, and camel were all considered. Articles were excluded on the basis that they focused on human breast or formula milk or did not exclusively evaluate the association between milk/dairy consumption and nutritional outcomes.

We verified that authors of articles included in the review did not report conflicts of interest (i.e. funding from the milk/dairy industry).

Acknowledgements

This report has been prepared by Kaela Connors with input from Lindsay Jaacks.

Report version: 1 June 2022