**Prevalence of Vitamin B12 and Folate Deficiencies in Indian Children and Adolescents**

Tattari Shalini1, Raghu Pullakhandam1, Santu Ghosh2, Bharati Kulkarni1, Hemalatha Rajkumar1, Harshpal S. Sachdev3, Anura V Kurpad2, G Bhanuprakash Reddy1#

1National Institute of Nutrition, Hyderabad, India

2St John’s Medical College, Bangalore, India

3Sitaram Bhartia Institute of Science and Research, New Delhi, India

#To whom correspondence should be addressed: Dr. G. Bhanuprakash Reddy, National Institute of Nutrition, Jamai-Osmania, Tarnaka, Hyderabad - 500 007, India. Tel: 91-40-27197252; Email: [geereddy@yahoo.com](file:///G:\GBR\Downloads\2014\MS\OcularBioChem%20PC\AppData\Local\Downloads\geereddy@yahoo.com); reddyg.bp@icmr.gov.in

**Running title:** Vitamin B12 and folate status in Indian children and adolescents

**Supplementary Table 1.** Comparison of characteristics of the study (vitamin B12 and folate) sample with the total survey sample

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Characteristics | | 1-4 years | | | 5-9 years | | | 10-19 years | | |
| Vitamin B12  % (95% CI) | Folate  % (95% CI) | CNNS total  % (95% CI) | Vitamin B12  % (95% CI) | Folate  % (95% CI) | CNNS total  % (95% CI) | Vitamin B12  % (95% CI) | Folate  % (95% CI) | CNNS total  % (95% CI) |
| Age | 1-2 years | 38.6  (36.4-40.9) | 38.7  (36.7-40.7) | 48.6  (47.5-49.6) | 5-6 years: 39.7  (38.0-41.4) | 38.8  (37.3-40.3) | 40.4  (39.4-41.4) | 10-14 years: 52.8 (51.4-54.3) | 52.6  (51.3-53.9) | 51.8  (51.2-52.5) |
| 3-4 years | 61.4  (59.1-63.6) | 61.3  (59.3-63.3) | 51.4  (50.4-52.5) | 7-9 years: 60.3  (58.6-62.0) | 61.2  (59.7-62.7) | 59.6  (58.6-60.6) | 15-19 years: 47.2 (45.7-48.6) | 47.4  (46.1-48.7) | 48.2  (47.5-48.8) |
| Sex | Boys | 52.9  (50.3-55.4) | 52.5  (50.0-55.0) | 51.4  (50.3-52.6) | 51.6  (49.8-53.3) | 51.2  (49.4-52.9) | 50.4  (49.4-51.4) | 50.6  (48.6-52.5) | 50.6  (48.8-52.4) | 49.9  (48.8-50.9) |
| Girls | 47.1  (44.6-49.7) | 47.5  (45.0-50.0) | 48.6  (47.4-49.7) | 48.4  (46.7-50.2) | 48.8  (47.1-50.6) | 49.6  (48.6-50.6) | 49.4  (47.5-51.4) | 49.4  (47.6-51.2) | 50.1  (49.1-51.2) |
| Residence | Urban | 24.9  (21.7-28.4) | 25.7  (22.5-29.1) | 23.8  (21.4-26.3) | 23.6  (20.7-26.8) | 25.1  (22.1-28.2) | 24.2  (21.8-26.8) | 25.2  (22.1-28.6) | 25.7  (22.6-29.0) | 24.7  (22.3-27.4) |
| Rural | 75.1  (71.6-78.3) | 74.3  (70.9-77.5) | 76.2  (73.7-78.6) | 76.4  (73.2-79.3) | 74.9  (71.8-77.9) | 75.8  (73·2-78·2) | 74.8  (71.4-77.9) | 74.3  (71.0-77.4) | 75.3  (72.6-77.7) |
| Mothers' Schooling | Primary | 34.3  (31.7-36.9) | 34.6  (31.9-37.3) | 37.8  (35.9-39.9) | 47.8  (45.4-50.3) | 47.9  (45.6-50.3) | 49.3  (47.4-51.2) | 16.3  (14.3-18.4) | 15.9  (14.1-18.0) | 14.6  (13.5-15.9) |
| Secondary | 44.3  (41.8-46.8) | 43.6  (41.3-46.0) | 41.8  (40.3-43.3) | 40.1  (38.0-42.3) | 39.8  (37.8-41.8) | 37.9  (36.5-39.3) | 68.7  (66.2-71.1) | 69.3  (67.0-71.5) | 69.1  (67.7-70.4) |
| Higher Secondary | 10.8  (9.3-12.5) | 11.4  (9.9-13.1) | 10.0  (9.2-10.9) | 6.7  (6.0-7.6) | 6.9  (6.2-7.8) | 6.7  (6.2-7.3) | 9.7  (7.7-12.1) | 9.5  (7.7-11.6) | 9.1  (8.4-9.9) |
| Graduation & above | 10.7  (9.2-12.4) | 10.4  (9.0-12.0) | 10.3  (9.5-11.2) | 5.3  (4.7-6.1) | 5.4  (4.8-6.1) | 6.1  (5.5-6.6) | 5.3  (4.4-6.3) | 5.3  (4.5-6.3) | 7.2  (6.5-8.0) |
| Wealth Index | Poorest | 15.9  (13.8-18.3) | 15.8  (13.7-18.1) | 20.3  (18.1-22.6) | 18.1  (16.2-20.3) | 18.0  (15.8-20.4) | 20.0  (18.0-22.2) | 17.8  (15.5-20.4) | 18.3  (16.0-20.8) | 20.0  (17.9-22.3) |
| Poor | 21.2  (18.5-24.1) | 20.5  (17.9-23.4) | 19.4  (18.1-20.8) | 21.3  (19.4-23.3) | 20.2  (18.5-21.9) | 20.0  (18.6-21.4) | 20.5  (18.8-22.3) | 20.6  (18.9-22.3) | 20.0  (18.8-21.2) |
| Middle | 22.3  (20.4-24.3) | 21.7  (19.9-23.5) | 20.2  (19.0-21.4) | 21.5  (19.9-23.3) | 21.0  (19.4-22.5) | 20.0  (18.9-21.2) | 21.4  (19.8-23.1) | 20.3  (18.8-21.9) | 20.0  (18.9-21.1) |
| Rich | 20.8  (18.9-22.9) | 21.7  (19.7-23.9) | 20.0  (18.8-21.2) | 21.0  (19.4-22.7) | 21.6  (19.9-23.3) | 20.0  (18.8-21.3) | 20.9  (19.3-22.7) | 21.0  (19.4-22.8) | 20.0  (18.8-21.2) |
| Richest | 19.8  (17.7-22.0) | 20.3  (18.3-22.5) | 20.1  (18.7-21.6) | 18.0  (16.4-19.8) | 19.3  (17.6-21.1) | 20.0  (18.5-21.6) | 19.3  (17.5-21.2) | 19.8  (17.9-21.8) | 20.0  (18.6-21.5) |

**Supplementary Table 2.** Prevalence of vitamin B12 and folate deficiency in children and adolescents by socio-demographic and WASH variables

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Characteristics | | 1-4 years | | 5-9 years | | 10-19 years | |
| Vitamin B12 deficiency  % (95% CI) | Folate  deficiency  % (95% CI) | Vitamin B12 deficiency  % (95% CI) | Folate  deficiency  % (95% CI) | Vitamin B12 deficiency  % (95% CI) | Folate  deficiency  % (95% CI) |
| Residence | Urban | 14.4a  (9.9-20.4) | 23.5a  (20.5-26.8) | 15.7a  (11.9-20.4) | 31.1a  (27.4-35.0) | 30.5a  (27.1-34.0) | 40.9a  (35.6-46.3) |
| Rural | 13.6a  (11.4-16.3) | 22.5a  (19.5-25.7) | 17.8a  (15.7-20.1) | 26.5a  (23.7-29.5) | 31.2a  (28.2-34.3) | 33.8a  (30.7-37.1) |
| Currently in school | Yes |  | - | 17.4a  (15.5-19.4) | 28.1a  (25.8-30.5) | 31.1a  (28.3-33.9) | 36.7a  (34.0-39.4) |
| No | - | - | 16.1a  (11.7-21.9) | 22.5a  (17.9-27.9) | 30.9a  (26.5-35.6) | 33.4a  (29.4-37.8) |
| Mother’s Schooling | Primary | 16.4a  (12.7-20.9) | 25.2a  (21.4-29.5) | 20.4a  (17.7-23.5) | 25.2a  (22.3-28.4) | 26.6a  (20.3-34.0) | 38.8a  (33.0-44.9) |
| Secondary | 12.5ab  (10.6-14.7) | 23.9a  (21.1-26.9) | 14.1b  (12.2-16.2) | 30.4a  (27.5-33.4) | 30.8a  (27.8-34.1) | 41.5a  (38.3-44.7) |
| Higher secondary | 8.3b  (5.9-11.5) | 16.2b  (12.9-20.2) | 17.1ab  (13.0-22.2) | 32.5ab  (27.3-38.0) | 30.0a  (20.2-42.2) | 41.9a  (31.0-53.6) |
| Graduate and above | 16.9ab  (7.9-32.4) | 16.9ab  (12.6-22.3) | 14.4ab  (9.0-22.3) | 23.4ab  (19.5-27.8) | 28.4a  (22.4-35.3) | 34.4a  (27.8-41.6) |
| Father’s Occupation | Professional | 11.6a  (8.1-16.3) | 17.0a  (13.1-21.8) | 17.7a  (13.6-22.9) | 21.1a  (17.1-25.7) | 37.1a  (28.6-46.5) | 23.1a  (18.7-28.1) |
| Sales and services | 11.5a  (8.9-14.8) | 22.3ab  (19.6-25.3) | 14.7a  (11.8-18.3) | 30.4b  (27.4-33.6) | 27.9a  (24.6-31.4) | 39.5b  (35.9-43.1) |
| Manual, Agriculture | 13.8a  (11.6-16.3) | 25.7b  (22.3-29.4) | 17.5a  (15.3-20.0) | 30.0b  (27.0-33.1) | 31.2a  (28.5-34.0) | 39.3b  (36.0-42.7) |
| Others | 20.0a  (11.7-31.9) | 16.5ac  (12.1-22.0) | 20.7a  (15.5-27.2) | 17.1ac  (13.4-21.5) | 31.7a  (26.7-37.1) | 23.6ac  (19.4-28.3) |
| Wealth Index | Poorest | 13.8a  (10.2-18.4) | 19.9a  (14.9-26.1) | 22.2a  (17.8-27.3) | 20.7a  (15.4-27.1) | 30.7a  (25.0-37.0) | 27.0a  (21.6-33.2) |
| Poor | 15.0a  (10.1-21.6) | 23.3a  (18.2-29.2) | 14.7a  (11.7-18.4) | 23.5a  (20.0-27.4) | 28.0a  (23.2-33.3) | 32.0ab  (27.8-36.6) |
| Middle | 13.9a  (10.3-18.5) | 25.1a  (21.3-29.3) | 18.0a  (14.8-21.6) | 29.6ab  (26.0-33.5) | 30.0a  (25.7-34.7) | 35.9ab  (32.1-39.9) |
| Rich | 13.1a  (9.7-17.5) | 24.4a  (21.2-28.0) | 16.8a  (14.2-19.9) | 33.6b  (30.4-37.0) | 33.5a  (29.7-37.6) | 40.3b  (36.2-44.6) |
| Richest | 13.2a  (9.8-17.6) | 20.2a  (17.4-23.2) | 15.0a  (11.6-19.2) | 29.6ab  (26.6-32.8) | 32.9a  (29.2-36.9) | 42.0b  (37.2-47.0) |
| Drinking water source | Piped & Improved | 13.3a  (11.2-15.8) | 21.0a  (18.7-23.4) | 17.4a  (15.5-19.4) | 26.3a  (24.0-28.6) | 31.1a  (28.5-33.9) | 33.3a  (30.8-36.0) |
| Non-piped & Improved | 19.7a  (10.6-33.6) | 32.3b  (26.4-38.8) | 17.9a  (9.7-30.8) | 33.6ab  (26.3-41.9) | 32.5a  (28.0-37.3) | 48.0b  (40.4-55.6) |
| Unimproved | 12.1a  (7.9-18.1) | 35.8ab  (23.0-51.0) | 15.9a  (11.9-21.0) | 39.2b  (30.4-48.8) | 29.6a  (22.2-38.2) | 54.7b  (45.7-63.5) |
| Hand washing | Basic | 13.4a  (10.4-17.1) | 23.0a  (20.3-25.9) | 17.2a  (15.3-19.3) | 28.7a  (26.3-31.3) | 32.7a  (29.9-35.7) | 38.0a  (35.0-41.1) |
| Limited | 14.0a  (11.5-16.9) | 26.0a  (22.3-29.9) | 16.3a  (13.7-19.3) | 28.5ab  (24.9-32.4) | 30.6a  (26.6-34.8) | 36.0ab  (32.2-39.9) |
| No facility | 14.7a  (9.2-22.7) | 14.1b  (10.6-18.5) | 20.2a  (14.5-27.5) | 21.3b  (17.4-25.7) | 27.0a  (22.6-32.0) | 28.0b  (22.7-33.9) |
| Sanitation | Improved & Not shared | 11.9a  (9.3-15.0) | 24.1a  (21.4-27.0) | 16.2a  (13.5-19.3) | 32.2a  (29.6-34.9) | 31.0a  (28.5-33.7) | 39.3a  (36.3-42.5) |
| Improved & Shared | 12.9a  (9.5-17.3) | 19.8a  (16.0-24.3) | 13.8a  (10.9-17.4) | 25.8ab  (22.4-29.5) | 27.2a  (22.5-32.4) | 35.3ab  (30.7-40.0) |
| Unimproved | 15.9a  (12.8-19.6) | 22.4a  (18.8-26.5) | 19.2a  (16.4-22.3) | 24.4b  (21.0-28.2) | 31.6a  (27.7-35.8) | 31.8b  (27.9-36.1) |

Superscripts abc with different letters in the same column indicate estimates with non-overlapping CI

D:\Shalini (local e)\CNNS\CNNS NEW\B12 & FA MS\EJN\Sup Fig 1A.tif

**Supplementary Fig.1A** Association between the vitamin B12 prevalence by state across all the age groups (A) 1-4 years vs 5-9 years (B) 1-4 years vs 10-19 years and (C) 5-9 years vs 10-19 years

D:\Shalini (local e)\CNNS\CNNS NEW\B12 & FA MS\EJN\Sup Fig 1B.tif

**Supplementary Fig.1B** Association between the folate prevalence by state across all the age groups (A) 1-4 years vs 5-9 years (B) 1-4 years vs 10-19 years and (C) 5-9 years vs 10-19 years