Supplementary Table 1 Risk factors for adolescent anemia stratified by adolescent sex in rural western China, 2016

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Factors | Male | | | Female | | | P values for interaction between sex and factors2 |
| No. (%) of anemia | Adjusted OR1 | 95% CI | No. (%) of anemia | Adjusted OR1 | 95% CI |
| Maternal age/years3 |  |  |  |  |  |  | 0.01 |
| Q1: ≤35 | 37(11.4) | 1.00 |  | 47(14.9) | 1.00 |  |  |
| Q2: 36-39 | 15(6.3) | 0.54 | 0.24, 1.19 | 30(17.9) | 1.17 | 0.64, 2.14 |  |
| Q3: ≥40 | 33(10.8) | 1.01 | 0.39, 2.64 | 16(10.0) | 0.54 | 0.20, 1.48 |  |
| Maternal education |  |  |  |  |  |  | 0.008 |
| < 3 years | 5(8.9) | 1.00 |  | 12(38.7) | 1.00 |  |  |
| Primary | 39(14.5) | 1.61 | 0.52, 4.92 | 22(13.4) | 0.15 | 0.06, 0.41 |  |
| Secondary | 37(8.9) | 0.97 | 0.30, 3.15 | 52(15.3) | 0.25 | 0.09, 0.68 |  |
| High school+ | 4(3.1) | 0.51 | 0.10, 2.73 | 7(6.7) | 0.17 | 0.04, 0.66 |  |
| Maternal occupation |  |  |  |  |  |  | 0.61 |
| Farmer | 25(7.2) | 1.00 |  | 23(9.4) | 1.00 |  |  |
| Others | 60(11.4) | 1.03 | 0.56, 1.90 | 70(17.6) | 0.58 | 0.33, 1.06 |  |
| Paternal age/years3 |  |  |  |  |  |  | 0.35 |
| Q1: ≤37 | 30(10.5) | 1.00 |  | 41(14.3) | 1.00 |  |  |
| Q2: 38-41 | 23(8.4) | 0.83 | 0.40, 1.74 | 35(17.2) | 1.02 | 0.57, 1.84 |  |
| Q3: ≥42 | 32(10.3) | 0.73 | 0.26, 2.07 | 17(11.2) | 0.72 | 0.25 2.04 |  |
| Paternal education |  |  |  |  |  |  | 0.48 |
| < 3 years | 2(16.7) | 1.00 |  | 2(28.6) | 1.00 |  |  |
| Primary | 14(10.1) | 0.32 | 0.05, 2.01 | 18(22.5) | 0.79 | 0.12, 5.38 |  |
| Secondary | 55(10.6) | 0.52 | 0.09, 3.18 | 59(15.7) | 0.56 | 0.08, 3.68 |  |
| High school+ | 14(6.9) | 0.68 | 0.10, 4.65 | 14(7.8) | 0.43 | 0.06, 3.17 |  |
| Paternal occupation |  |  |  |  |  |  | 0.09 |
| Farmer | 42(7.6) | 1.00 |  | 56(13.6) | 1.00 |  |  |
| Others | 40(13.5) | 0.58 | 0.33, 1.02 | 32(15.2) | 1.22 | 0.71, 2.12 |  |
| Household wealth |  |  |  |  |  |  | 0.40 |
| Low | 39(12.6) | 1.00 |  | 36(16.7) | 1.00 |  |  |
| Medium | 30(11.7) | 0.92 | 0.53, 1.61 | 40(21.2) | 1.62 | 0.93, 2.85 |  |
| High | 16(5.2) | 0.56 | 0.27, 1.13 | 17(7.1) | 0.61 | 0.30, 1.23 |  |
| Randomized regimens |  |  |  |  |  |  | 0.09 |
| Folic acid | 30(9.6) | 1.00 |  | 25(11.6) | 1.00 |  |  |
| Iron/folic acid | 32(11.4) | 1.16 | 0.65, 2.07 | 30(13.6) | 1.10 | 0.59, 2.08 |  |
| Multiple micronutrients | 23(8.2) | 0.95 | 0.52, 1.73 | 38(18.4) | 1.92 | 1.06, 3.47 |  |
| Adolescent age |  |  |  |  |  |  | 0.39 |
| 10 | 4(11.1) | 1.00 |  | 2(5.4) | 1.00 |  |  |
| 11 | 31(10.0) | 0.62 | 0.19, 2.02 | 24(10.5) | 1.61 | 0.35, 7.54 |  |
| 12 | 29(9.4) | 0.75 | 0.23, 2.51 | 42(17.6) | 2.53 | 0.53, 12.08 |  |
| 13-14 | 21(9.6) | 0.97 | 0.27, 3.52 | 25(17.9) | 2.67 | 0.52, 13.79 |  |
| Height for age z score |  |  |  |  |  |  | 0.56 |
| Stunting (<-2SD) | 3(18.8) | 1.00 | 0.20, 5.06 | 4(25.0) | 2.14 | 0.58, 7.94 |  |
| -2 to 1 SD | 73(11.1) | 1.00 |  | 80(15.2) | 1.00 |  |  |
| Above average (>1SD) | 9(4.5) | 0.57 | 0.25, 1.30 | 9(9.1) | 0.98 | 0.43, 2.23 |  |
| Whether having illness in last two weeks |  |  |  |  |  |  | 0.27 |
| Yes | 41(12.2) | 1.00 |  | 40(15.8) | 1.00 |  |  |
| No | 42(7.9) | 0.63 | 0.39, 1.02 | 53(13.6) | 0.92 | 0.56, 1.50 |  |
| Puberty development4 |  |  |  |  |  |  | 0.04 |
| Pre-puberty | 29(15.9) | 1.00 |  | 11(14.1) | 1.00 |  |  |
| Mild | 40(9.5) | 0.59 | 0.33, 1.06 | 31(13.7) | 0.92 | 0.39, 2.13 |  |
| Above mild | 15(5.7) | 0.35 | 0.15, 0.83 | 51(15.1) | 0.72 | 0.29, 1.78 |  |
| Times of consuming flesh foods per day (Mean/SD)5 |  |  |  |  |  |  | 0.57 |
| Q1 (Lowest) | 31(14.8) | 1.00 |  | 31(18.8) | 1.00 |  |  |
| Q2 | 22(7.9) | 0.51 | 0.27, 0.97 | 32(13.2) | 0.68 | 0.37, 1.24 |  |
| Q3 (Highest) | 32(8.3) | 0.58 | 0.33, 1.05 | 30(12.7) | 0.96 | 0.52, 1.77 |  |
| Times of consuming beans per day (Mean/SD)5 |  |  |  |  |  |  | 0.36 |
| Q1 (Lowest) | 33(11.5) | 1.00 |  | 29(12.9) | 1.00 |  |  |
| Q2 | 42(10.2) | 0.94 | 0.56, 1.59 | 52(16.7) | 1.55 | 0.90, 2.68 |  |
| Q3 (Highest) | 10(6.0) | 0.54 | 0.24, 1.21 | 12(11.8) | 0.94 | 0.42, 2.10 |  |
| Times of consuming dairy products per day (Mean/SD)5 |  |  |  |  |  |  | 0.63 |
| Q1 (Lowest) | 44(13.0) | 1.00 |  | 43(17.6) | 1.00 |  |  |
| Q2 | 20(6.9) | 0.56 | 0.31, 1.02 | 34(14.1) | 0.80 | 0.46, 1.39 |  |
| Q3 (Highest) | 20(8.4) | 0.70 | 0.38, 1.28 | 16(10.5) | 0.67 | 0.34, 1.32 |  |
| Times of consuming egg per day (Mean/SD)5 |  |  |  |  |  |  | 0.22 |
| Q1 (Lowest) | 34(11.6) | 1.00 |  | 42(18.1) | 1.00 |  |  |
| Q2 | 26(8.3) | 0.70 | 0.39, 1.26 | 37(14.9) | 0.87 | 0.52, 1.51 |  |
| Q3 (Highest) | 25(9.5) | 0.75 | 0.41, 1.37 | 14(8.9) | 0.46 | 0.23, 0.92 |  |
| Meal frequency in 24 hours |  |  |  |  |  |  | 0.80 |
| Two times | 50(13.1) | 1.00 |  | 50(17.7) | 1.00 |  |  |
| Three times and four times | 33(6.9) | 0.66 | 0.39, 1.09 | 43(12.1) | 0.66 | 0.39, 1.09 |  |

1The adjusted model included all the variables in the table except for dietary variables. And then, each of the dietary variables were put in the adjusted model above one at a time.

2The p values for interaction between sex and factors were calculated using likelihood-ratio test between including interaction terms and not including in the models.

3Parents’ age was categorized by its tertiles.

4Puberty development was defined by the Tanner stages.

5The frequency of consuming foods was converted into continuous variables namely times per day, which were then categorized by its tertiles. Flesh foods included meat, poultry and fish.

Supplementary Table 2 Risk factors associated with adolescent hemoglobin concentrations (g/L) stratified by adolescent sex in rural western China, 2016

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Factors | Male | | Female | | P values for interaction between sex and factorsb |
| Mean (SD) | Adjusted mean differences (95% CI) a | Mean (SD) | Adjusted mean differences (95% CI)a |
| Maternal age/yearsc |  |  |  |  | 0.62 |
| Q1: ≤35 | 133.7(15.9) | Ref. | 130.2(14.0) | Ref. |  |
| Q2: 36-39 | 135.5(13.6) | 1.00(-1.82, 3.83) | 130.8(14.3) | 0.10(-2.77, 2.97) |  |
| Q3: ≥40 | 135.7(15.6) | 2.08(-1.79, 5.95) | 130.7(14.1) | 1.70(-2.64, 6.05) |  |
| Maternal education |  |  |  |  | 0.003 |
| < 3 years | 134.2(12.4) | Ref. | 120.5(17.7) | Ref. |  |
| Primary | 132.7(16.3) | -0.36(-4.84, 4.11) | 130.5(13.9) | 11.95(6.23, 17.68) |  |
| Secondary | 135.3(15.3) | 2.09(-2.60, 6.79) | 130.5(14.6) | 10.73(4.81, 16.64) |  |
| High school+ | 138.3(12.9) | 2.16(-3.67, 7.98) | 132.7(10.2) | 11.20(4.38, 18.01) |  |
| Maternal occupation |  |  |  |  | 0.64 |
| Farmer | 133.6(15.1) | Ref. | 132.2(12.0) | Ref. |  |
| Others | 136.9(15.1) | 1.88(-0.54, 4.29) | 129.4(15.2) | 3.06(0.30, 5.83) |  |
| Paternal age/yearsc |  |  |  |  | 0.62 |
| Q1: ≤37 | 133.6(14.2) | Ref. | 130.3(13.4) | Ref. |  |
| Q2: 38-41 | 135.6(16.2) | 1.23(-1.59, 4.06) | 130.8(14.5) | 0.60(-2.20, 3.40) |  |
| Q3: ≥42 | 135.4(15.2) | 0.35(-3.67, 4.37) | 130.1(15.0) | 0.31(-4.30, 4.92) |  |
| Paternal education |  |  |  |  | 0.22 |
| < 3 years | 132.5(12.1) | Ref. | 117.3(15.2) | Ref. |  |
| Primary | 134.5(16.3) | 2.86(-6.23, 11.95) | 128.6(17.0) | 11.70(0.84, 22.57) |  |
| Secondary | 134.3(15.6) | 1.28(-7.77, 10.34) | 130.2(14.6) | 11.28(0.65, 21.92) |  |
| High school+ | 136.7(13.5) | -0.03(-9.46, 9.40) | 132.3(11.0) | 11.68(0.75, 22.61) |  |
| Paternal occupation |  |  |  |  | 0.78 |
| Farmer | 134.6(18.1) | Ref. | 130.6(13.2) | Ref. |  |
| Others | 135.2(13.5) | -1.12(-3.49, 1.26) | 130.5(15.9) | -1.85(-4.54, 0.83) |  |
| Household wealth |  |  |  |  | 0.39 |
| Low | 133.1(15.3) | Ref. | 129.3(15.9) | Ref. |  |
| Medium | 134.1(16.7) | 1.83(-0.67, 4.33) | 129.0(14.6) | -1.00(-3.86, 1.86) |  |
| High | 137.3(13.3) | 3.12(0.45, 5.80) | 132.6(11.5) | 1.37(-1.61, 4.35) |  |
| Randomized regimens |  |  |  |  | 0.07 |
| Folic acid | 135.5(16.9) | Ref. | 130.4(13.2) | Ref. |  |
| Iron/folic acid | 133.6(13.6) | -2.30(-4.69, 0.08) | 131.0(13.7) | 0.87(-1.85, 3.60) |  |
| Multiple micronutrients | 135.6(14.7) | -0.04(-2.46, 2.37) | 130.0(15.5) | -0.78(-3.52, 1.96) |  |
| Adolescent age |  |  |  |  | 0.08 |
| 10 | 129.8(16.0) | Ref. | 132.6(12.9) | Ref. |  |
| 11 | 132.4(16.6) | 4.10(-1.03, 9.22) | 129.1(14.3) | -2.07(-7.29, 3.15) |  |
| 12 | 135.8(14.2) | 5.70(0.47, 10.95) | 131.5(13.3) | 0.76(-4.74, 6.27) |  |
| 13-14 | 138.0(13.6) | 5.94(0.38, 11.51) | 130.3(15.3) | -0.46(-6.45, 5.52) |  |
| Height for age z score |  |  |  |  | 0.03 |
| Stunting (<-2SD) | 132.3(11.9) | 0.94(-6.61, 8.48) | 123.1(13.8) | -8.08(-15.48, -0.67) |  |
| -2 to 1 SD | 133.2(14.8) | Ref. | 130.5(14.1) | Ref. |  |
| Above average (>1SD) | 140.5(15.5) | 4.08(1.47, 6.69) | 131.6(14.2) | -0.17(-3.55, 3.21) |  |
| Whether having illness in last two weeks |  |  |  |  | 0.80 |
| Yes | 133.6(14.1) | Ref. | 129.3(12.9) | Ref. |  |
| No | 135.8(15.6) | 1.78(-0.25, 3.81) | 131.2(14.8) | 1.37(-0.91, 3.66) |  |
| Puberty development |  |  |  |  | <0.001 |
| Pre-puberty | 129.1(14.6) | Ref. | 127.8(13.3) | Ref. |  |
| Mild | 133.8(14.7) | 3.70(1.04, 6.37) | 130.5(14.7) | 1.43(-2.41, 5.27) |  |
| Above mild | 140.7(14.5) | 8.51(5.16, 11.86) | 131.0(13.8) | 1.70(-2.40, 5.81) |  |
| Times of consuming flesh foods per day (Mean/SD)d |  |  |  |  | 0.25 |
| Q1 (Lowest) | 133.4(15.1) | Ref. | 127.8(16.0) | Ref. |  |
| Q2 | 135.2(13.1) | 0.59(-2.10, 3.28) | 132.1(13.8) | 3.74(0.90, 6.59) |  |
| Q3 (Highest) | 135.5(16.6) | 0.56(-2.03, 3.15) | 130.6(12.7) | 1.44(-1.52, 4.39) |  |
| Times of consuming beans per day (Mean/SD)d |  |  |  |  | 0.96 |
| Q1 (Lowest) | 134.4(16.0) | Ref. | 130.5(14.1) | Ref. |  |
| Q2 | 134.6(15.3) | -0.87(-3.14, 1.39) | 130.0(14.1) | -1.20(-3.71, 1.30) |  |
| Q3 (Highest) | 136.2(13.8) | 0.06(-2.81, 2.93) | 131.3(14.3) | 0.54(-2.88, 3.97) |  |
| Times of consuming dairy products per day (Mean/SD)d |  |  |  |  | 0.66 |
| Q1 (Lowest) | 133.8(15.9) | Ref. | 130.1(15.0) | Ref. |  |
| Q2 | 135.8(14.5) | 1.44(-0.90, 3.78) | 130.4(13.2) | -0.19(-2.80, 2.42) |  |
| Q3 (Highest) | 135.4(14.8) | 1.18(-1.30, 3.67) | 131.1(14.1) | 0.20(-2.77, 3.17) |  |
| Times of consuming egg per day (Mean/SD)d |  |  |  |  | 0.17 |
| Q1 (Lowest) | 133.0(13.9) | Ref. | 129.1(14.4) | Ref. |  |
| Q2 | 136.7(14.9) | 3.65(1.42, 5.88) | 130.9(13.9) | 1.46(-1.12, 4.04) |  |
| Q3 (Highest) | 134.3(14.6) | 2.02(-0.31, 4.35) | 131.8(14.2) | 2.99(0.08, 5.91) |  |
| Meal frequency in 24 hours |  |  |  |  | 0.33 |
| Two times | 133.0(16.1) | Ref. | 128.5(14.7) | Ref. |  |
| Three times and four times | 136.4(14.2) | 0.65(-1.42, 2.72) | 132.0(13.5) | 2.75(0.37, 5.12) |  |

aThe adjusted model included all the variables in the table except for dietary variables. And then, each of the dietary variables were put in the adjusted model above one at a time.

bThe p values for interaction between sex and factors were calculated using likelihood-ratio test between including interaction terms and not including in the models.

cParents’ age was categorized by its tertiles.

dThe frequency of consuming foods was converted into continuous variables namely times per day, which were then categorized by its tertiles. Flesh foods included meat, poultry and fish.