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## Risk Factors for Obesity in Adolescents of Ethnic Groups in Rural Areas of the Republic of Buryatia: a Cross-Sectional Study

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**Background.** Obesity develops as a result of interaction of genetic and environmental factors. The impact of environmental factors on the risk of obesity in children can be determined by socially conditioned causes. **Objective.** Our aim was to identify the risk factors associated with overweight / obesity in children of different ethnic groups living in rural areas of the Republic of Buryatia. **Methods.** The cross-sectional study included adolescents aged 11–17 years. Overweight was considered to be the body mass index (BMI) values exceeding the 85th percentile of distribution for a given sex and age, obesity was considered to be the BMI  $\geq$  the 95th percentile. We assessed the anthropometric measures of adolescents and their parents, socio-demographic characteristics, features of early history, eating behaviour, and lifestyle. **Results.** The study included 151 adolescents of the indigenous Asian (girls — 39.7%) and 118 Slavic (girls — 42.4%) ethnic groups. Overweight and obesity were detected in 53 (35%) and 36 (31%) adolescents, respectively. Independent risk factors for overweight / obesity in adolescents of both ethnic groups were BMI in their mothers — odds ratio (OR) 1.2 (95% confidence interval [CI] 1.1–1.3) and 1.3 (95% CI 1.1–1.4), respectively; in adolescents of indigenous Asian ethnic groups, infrequent food intake — OR 4.2 (95% CI 1.1–16.1), living in an incomplete family — OR 4.4 (95% CI 1.3–14.1), and mother-housewife — OR 3.6 (95% CI 1.3–9.7); in adolescents of the Slavic ethnic groups — eating at night [OR 17.3 (95% CI 1.8–163.0)]. **Conclusion.** The risk factors for overweight / obesity in rural adolescents, regardless of their ethnicity, are overweight in mothers and irregular food intake of children. The risk factors for adolescents of indigenous Asian ethnic groups include social (family-related) characteristics such as living in single-parent families and families with non-working mothers.

**Key words:** adolescents, rural residents, obesity, overweight, risk factors, the Republic of Buryatia, ethnic groups.

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## RESULTS

**Table 1.** Clinical and anamnestic features of adolescents of different ethnicity with normal and excess body weight / obesity

Parameters	Teens of Asian ethnic groups		p	Teens of Slavic ethnic groups		p
	Overweight*, n =53	Normal weight,		Overweight*, n =36	Normal weight,	

		<i>n</i> =98			<i>n</i> =82	
Mother's BMI, kg/m <sup>2</sup>	27.6 ± 4.7	24.4 ± 4.9	0.001	28.2 ± 5.2	23 ± 4.3	0.001
Father's BMI, kg/m <sup>2</sup>	26.8 ± 4.2	26.9 ± 3.4	0.947	26.6 ± 4.5	25.7 ± 3.2	0.228
Obesity in parents, abs. (%)	22 (42)	28 (29)	0.060	18 (50)	9 (11)	0.001
Birth weight, g:	3,276 ± 417	3,344 ± 496	0.400	3,352 ± 432	3,318 ± 422	0.685
• < 2500	1 (2)	4 (4)	0.808	1 (3)	3 (4)	0.757
• 2500–4000	51 (96)	85 (87)	0.115	32 (89)	76 (93)	0.747
• > 4000	1 (2)	9 (9)	0.168	3 (8)	3 (4)	0.542
Early (up to 4 months) transition to formula feeding, abs. (%)	12 (23)	14 (14)	0.284	9 (25)	16 (19)	0.669
Duration of breastfeeding > 1 year, abs. (%)	3 (6)	25 (26)	0.006	2 (6)	26 (32)	0.005
First complementary food, month	4.8 ± 1.3	4.7 ± 0.7	0.539	5.1 ± 1.4	4.9 ± 1.2	0.430
Introduction of complementary food after 6 months, abs. (%)	1 (2)	2 (1)	0.585	4 (12)	4 (4)	0.400
<b>Anthropometric characteristic</b>						
Height, cm	163 ± 12	161 ± 9	0.320	164 ± 11	163 ± 10	0.607
Height SDS	0.3 ± 1	-0.2 ± 0.9	0.001	0.56 ± 1.2	0.09 ± 1.03	0.029
Weight, kg	74.8 ± 17.3	50.6 ± 7.7	0.001	76.4 ± 14.9	53.3 ± 9.6	0.001
BMI, kg/m <sup>2</sup>	28.1 ± 4.1	19.5 ± 1.5	0.001	28.2 ± 4.4	19.8 ± 1.9	0.001
BMI SDS	2.2 ± 0.7	-0.09 ± 0.6	0.001	2.2 ± 0.8	-0.005 ± 0.6	0.001
Waist circumference, cm	86 ± 14	64 ± 7	0.001	87 ± 12	67 ± 7	0.001
Waist circumference / height ratio	0.5 ± 0.07	0.4 ± 0.04	0.001	0.5 ± 0.07	0.4 ± 0.04	0.001
Puberty stage according to Tanner, abs. (%):						
• 1	8 (15)	25 (25)	0.203	9 (25)	16 (19)	0.669
• 2	18 (34)	35 (36)	0.971	9 (25)	33 (40)	0.166
• 3	5 (9)	19 (19)	0.173	4 (16)	23 (28)	0.075
• 4	8 (34)	7 (7)	0.203	2 (6)	2 (2)	0.757
• 5	14 (26)	11 (11)	0.030	12 (33)	8 (10)	0.003

*Note.* \* Overweight (BMI > the 85th percentile of distribution for a given sex and age) and obese (BMI ≥ the 95th percentile) children. BMI — body mass index, SDS — standard deviation of the mean population values.

**Table 2.** Peculiarities of behaviour and lifestyle in adolescents of different ethnicity with normal and excess body weight / obesity

Parameters	Teens of Asian ethnic groups		<i>p</i>	Teens of Slavic ethnic groups		<i>p</i>
	<i>Overweight</i> *, <i>n</i> =53	<i>Normal weight</i> , <i>n</i> =98		<i>Overweight</i> *, <i>n</i> =36	<i>Normal weight</i> , <i>n</i> =82	
Physical activity, abs. (%)						
• Low	2 (4)	0	0.234	1 (3)	0	0.671
• Moderate	33 (62)	67 (68)	0.564	24 (67)	55 (67)	0.866
• High	18 (34)	31 (32)	0.913	11 (31)	27 (33)	0.968
Watching TV, using a computer > 3 hrs/day	26 (49)	50 (51)	0.952	16 (44)	23 (28)	0.126
Food intake frequency (per day), abs. (%)						
• 3–4	19 (36)	36 (37)	0.945	18 (50)	64 (78)	0.005
• <3	7 (13)	7 (7)	0.351	0	1 (1)	0.660
• >4	25 (47)	55 (56)	0.378	18 (50)	17 (21)	0.003
Food intake before bed (after 7 p.m.)	28 (53)	44 (45)	0.447	23 (64)	46 (56)	0.557
Food intake at night	2 (4)	7 (7)	0.635	6 (17)	1 (1)	0.004

*Note.* \* Overweight (BMI > the 85th percentile of distribution for a given sex and age) and obese (BMI ≥ the 95th percentile) children. BMI — body mass index.

**Table 3.** Socio-demographic characteristics of adolescents of different ethnicity with normal and excess body weight / obesity

Parameters	Teens of Asian ethnic groups		<i>p</i>	Teens of Slavic ethnic groups		<i>p</i>
	<i>Overweight*</i> , <i>n</i> =53	<i>Normal weight</i> , <i>n</i> =98		<i>Overweight*</i> , <i>n</i> =36	<i>Normal weight</i> , <i>n</i> =82	
Girls, abs. (%)	18 (34)	42 (42.9)	0.372	14 (38.9)	36 (43.9)	0.760
Age, years	13.7 ± 1.9	14.1 ± 1.8	0.203	13.9 ± 1.9	14.3 ± 1.8	0.286
Social status of the mother, abs. (%)						
• Employee	20 (38)	50 (51)	0.164	6 (17)	23 (28)	0.276
• Labourer	13 (25)	22 (22)	0.931	18 (50)	24 (29)	0.050
• Housewife	20 (38)	26 (27)	0.214	12 (33)	33 (40)	0.513
Education of the mother, abs. (%)						
• Higher	18 (34)	32 (33)	0.986	4 (11)	10 (12)	0.887
• Secondary	33 (62)	65 (66)	0.749	32 (89)	72 (87)	0.887
• Elementary	2 (4)	1 (1)	0.585	0	0	
Higher education in parents	23 (43)	50 (51)	0.469	6 (17)	13 (16)	0.872
Single-parent family	16 (31)	19 (19)	0.194	3 (8)	14 (17)	0.337
Mother's age at baby birth, years	25.4 ± 6	25.4 ± 4.7	0.954	24.5 ± 6	24.3 ± 5.1	0.814
Father's age at baby birth, years	29 ± 6	27.3 ± 4.7	0.096	27.7 ± 8	26.9 ± 6.2	0.583

*Note.* \* Overweight (BMI > the 85th percentile of distribution for a given sex and age) and obese (BMI ≥ the 95th percentile) children. BMI — body mass index.

**Table 4.** Independent predictors of overweight / obesity in adolescents of different ethnic groups

Parameters	Teens of Asian ethnic groups		Teens of Slavic ethnic groups
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>
Mother-housewife	2.46 (1.01–5.97)	3.58 (1.31–9.73)	0.86 (0.36–2.36)
Single-parent family	2.86 (1.06–7.73)	4.37 (1.35–14.11)	0.52 (0.14–1.95)
Mother's BMI	1.13 (1.04–1.22)	1.16 (1.06–1.26)	1.26 (1.13–1.40)
Infrequent food intake	4.21 (1.10–16.13)	-	1.40 (0.62–3.14)
Eating at night	0.40 (0.07–2.46)	-	17.26 (1.83–162.96)

*Note.* Model 1 — during multivariate analysis, the value of OR (95% CI) for the independent variable was calculated with allowance for sex, age, and puberty. The use of the variable «sex of adolescents» was justified by the results of previous studies [15]. Model 2 — during multivariate analysis, the values of OR (95% CI) for the independent variable was calculated with allowance for age and puberty stage.

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